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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior



VOLUME 10, NUMBER 17 SEPTEMBER 1, 1977

W77-08101 -- W77-08600

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978. As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wild-life, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstract-

ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Research and Technology U.S. Department of the Interior Washington, DC 20240

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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

MEASUREMENT OF THE ATTENUATION OF WATER IN THE VISIBLE REGION OF THE SPECTRUM,

Missouri Univ., Kansas City. Dept. of Physics.

P. G. Cary.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 916, Price codes: A05 in paper copy, A01 in microfiche. M.S. Degree, 1976. 69 p, 6 fig, 2 tab, 16 ref. OWRT A-091-MO(1), 14-34-0001-6026.

Descriptors: Attenuation. Measurement, *Electromagnetic *Radiation. Methodology, *Absorption, Methodolo techniques, Water properties. Analytical Identifiers: *Attenuation coefficient(Water), Wave length region(418-640 nm).

The attenuation coefficient of water was measured for the 418-640nm wave-length region of the electromagnetic spectrum. The extinction coefficient of water was calculated from the attenuation coefficient. The use of a 5.0m long sample cell and a 0.25m long reference cell provided an attenuation path length of approximately 9.5m. A wavelength path length of approximately 9.5m. A Wavelength tuneable organic dye laser provided a source of quasimonochromatic electromagnetic radiation. The results were displayed graphically, tabulated, and compared to values reported by previous investigators. (Waring-Missouri) W77-08293

2. WATER CYCLE

2A. General

ON THE RELATIONSHIP BETWEEN THE FINITE ELEMENT AND FINITE DIFFERENCE Survey, Trenton, N.J. Water Geological

Resources Div.

For primary bibliographic entry see Field 7A. W77-08168

APPLICATION OF THREE DAILY-RAINFALL RUNOFF MODELS TO FOUR AUSTRALIAN CATCHMENTS, Monash Univ., Clayton (Australia). Dept. of Civil

Engineering.
I. D. Moore, and R. G. Mein.

Research Report 3/76, May 1976. 48 p, 15 fig, 18

Descriptors: *Hydrology, *Australia, *Rainfall-runoff relationships, *Model studies, Streamflow, models, Watersheds(Basins), Surface runoff.
Identifiers: *Monash Model, *Boughton Model,

Stanford Watershed Model.

Three mathematical rainfall-runoff models, the Boughton Model, the Monash Model, and the Stanford Watershed Model, were applied to four rural catchments in Australia. The models were rural catchments in Australia. The models were comparatively evaluated based on their data requirements, their computer processor time, their ability to predict streamflow, and the effort required by an independent user to achieve com-petence with the models. A split record technique was employed to calibrate and test the models. No one model performed better than any of the others in all cases. Results showed that the Monash and Stanford Models performed about equally well for daily flow prediction, and that all three gave com-parable results for monthly flow prediction. Although the Boughton Model was inferior in predicting the daily flows, it had the advantage in that its data requirements were the most easily satisfied. It required less computer processor time, ud, in addition, it was conceptually the simplest model and was the easiest to operate. Although the Monash and Stanford Models were comparable in many respects, the routing routine in the Monash Model and the groundwater discharge routine in the Stanford Model appeared superior to the cor-responding routines in the other models. Results also indicated the limitations of using daily inpuut data and models operating on daily time incre-ments to predict daily streamflow. (Jones-ISWS) W77-08218

LOW FLOW ANALYSES OF STREAMS:
DETAILS OF COMPUTATIONAL
PROCEDURES AND ANNOTATED BIBLIOG-

RAPHY, Monash Univ., Clayton (Australia). Dept. of Civil For primary bibliographic entry see Field 2E. W77-08219

A NEW CLIMATIC MODEL FOR GLACIER BEHAVIOR OF THE AUSTRIAN ALPS, Rider Coll., Trenton, N.J. Dept. of Geosciences. For primary bibliographic entry see Field 2C. W77-08235

REGIONAL SIMULATION OF STREAMFLOW

North Carolina Univ., Raleigh. Dept. of Biological and Agricultural Engineering. E. H. Wiser.

Available from the National Technical Informaroun in National Technical Information Service, Springfield, VA 22161 as PB-267 910, Price codes: A03 in paper copy, A01 in microfiche. Paper presented at ASAE Meeting, University of Nebraska, Lincoln, Nebraska, June 27-30, 1976. 38 p, 6 fig, 1 tab. OWRT B-064-NC(1), 14-31-0001-4112.

Descriptors: *Streamflow forecasting, *Computer models, *Computer programs, *Simulation analysis, Rainfall, Streamflow, River basins, Drainage

basins, Model studies.
Identifiers: *Watershed models, Hydrologic Information Storage and Retrieval System(HISARS), Streamflow Synthesis and Reservoir Regulation(SSARR).

The North Carolina Streamflow Synthesis and Reservoir Regulation (NCSSARR) system was tested first in the Neuse River basin. Calibration runs were made on two watersheds, one in the Piedmont and the other in the Coastal Plain. On the basis of the parameter values thus obtained, parameters were estimated for all other sub-basins, and simulation results obtained for a 25year period at 123 points in the basin. Results were ared with measured flows at 16 gaging stations. The tests showed that the quantity of the flow was reliable, and the monthly totals agreed quite well, but timing of the flow was causing some problems and low flow estimates were too low to be useful. Watersheds with topographic conditions intermediate between the Piedmont and Control Piedmont and Piedmont Coastal Plain also caused some problems. Potential applications of the system are considerable. It will be possible to estimate streamflow into the estuaries; to estimate streamflow at a point where a sewage treatment plant is proposed; to estimate the effect of interbasin transfers of water such as the proposed diversion of water from the Roanoke River to Norfolk; to determine the effect of alternate reservoir operating policies on downstream flow. (See also W76-12250) (Stewart-NC State) W77-08298

DETERMINING AREAL PRECIPITATION IN THE BASIN AND RANGE PROVINCE OF

SOUTHERN ARIZONA - SONOITA CREEK BASIN, Arizona Water Resources Research Center, Tuc-

For primary bibliographic entry see Field 2B. W77-08308

THE EFFECTS OF URBANIZATION ON LOW FLOWS AND TOTAL RUNOFF, Purdue Univ., Lafayette, Ind. School of Civil En-

gineering. R. W. Shanks, and A. R. Rao.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 046, Price codes: A06 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center, Lafayette Technical Report No. 94, May 1977, 101 p., 14 fig, 17 tab, 16 ref. OWRT C-6106(No. 5213) (1).

Descriptors: *Rainfall-Runoff relationships, *Urban runoff, *Urban hydrology, Storm runoff, Urban drainage, *Urbanization, *Low flow, Mass curves, Flow duration, Stream flow, Stream flow forecasting, Rainfall.

Identifiers: Linearized Model, 7-Day Low Flow, 1-Day Low Flow.

The objective was to investigate the effects of urbanization on the low flow and total runoff characteristics of streams. The data used in the analysis included the 1 and 7-day flows and total annual runoff sequences from six urban streams located throughout the United States. The observed flow sequences were analyzed by using mass curve analysis in order to determine the time at which changes in the flow sequence patterns took place. The year in which these changes became evident was then used to separate the flows into two groups. The period before the year of change represented the flows unaffected by the urbanization process. The period after the year of change represented the affected flows. In an attempt to explain these changes in the observed flow sequences, rainfall data were examined by similar mass curve methods. The rainfall characteristics remained approximatley the same through the periods of record. The rainfall-runoff relationships for each water shed were analyzed in order to determine the extent of the changes in the total annual runoff. The analysis was accomplished by linearizing the rainfall-runoff relationships by the transformation technique developed by Box and Cox. The slopes of the relationships for the unaffected and affected periods were compared to determine the magnitude of the changes which had taken place. Models of only the observed flows were also developed and analyzed.

2B. Precipitation

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED
NEAR NEW ORLEANS, LOUISIANA (LAKE
PONTCHARTRAIN, LOUISIANA, AND VICINITY HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, La. Water Resources Div. For primary bibliographic entry see Field 8D. W77-08165

RAINFALL INFILTRATION CHARAC-TERISTICS FOR A SEMI-ARID WATERSHED SOIL,

Arizona Water Resources Research Center, Tuc-For primary bibliographic entry see Field 2G. W77-08206

Field 2-WATER CYCLE

Group 2B—Precipitation

APPLICATION OF THREE DAILY-RAINFALL RUNOFF MODELS TO FOUR AUSTRALIAN CATCHMENTS, Monash Univ., Clayton (Australia). Dept. of Civil

For primary bibliographic entry see Field 2A. W77-08218

THE AFGWC SNOW COVER ANALYSIS MODEL

Air Force Global Weather Central, Offutt AFB,

For primary bibliographic entry see Field 2C. W77-08223

NITROGEN AND PHOSPHORUS ANALYSES OF RAINFALL AT ROTORUA, NEW ZEA-LAND,

Marine Dept., Rotorua (New Zealand). Fisheries Research Div.
For primary bibliographic entry see Field 5A.

THE FALLOUT OF NITROGEN AND PHOSPHORUS COMPOUNDS FROM THE AT-MOSPHERE AT NGAPUNA, NEAR ROTORUA, NEW ZEALAND,

Marine Dept., Rotorua (New Zealand). Fisheries Research Div.

For primary bibliographic entry see Field 5A. W77-08243

FLASH FLOODS IN THE WESTERN MEDITER-RANEAN (LES CRUES CATASTROPHIQUES SUR LA MEDITERRANEE OCCIDENTALE), Servicio Meteorologico Nacional, Madrid (Spain). For primary bibliographic entry see Field 2E. W77-08245

FLASH FLOODS IN SPAIN (LES CRUES BRU-

TALES EN ESPAGNE), Consejo Superior di Investigaciones Cientificas, Madrid (Spain). Instituto de Hidrologia. For primary bibliographic entry see Field 2E. W77-08247

DETERMINING AREAL PRECIPITATION IN THE BASIN AND RANGE PROVINCE OF SOUTHERN ARIZONA - SONOITA CREEK BASIN

Arizona Water Resources Research Center, Tuc-

J. Ben-Asher, J. Randall, and S. Resnick. In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1976 meetings of the Amer. Water Resources Association, Arizona Section, and the Ariz. Academy of Science, Hydrology Section, Tucson, AZ., 4/28-5/1/76. 7 p, 6 fig, 5 ref. OWRT A-069-ARIZ(1), 14-34-0001-6003.

*Isohyets, Descriptors: Areal *Precipitation(Atmospheric), *Arizona, *Simulated rainfall, Simulation analysis, Maps, Seasonal, Model studies.
Identifiers: *Areal precipitation, Four point interpolation, *Sonoita Creek basin(Ariz).

A linear relationship between point precipitation and elevation in conjunction with a computer fourpoint interpolation technique was used to simulate areal rainfall over Sonoita Creek Basin, Arizona. areai raintail over sonoita Creek Basin, Anzona. The simulation's sensitivity and accuracy were checked against the official isohyetal map of Arizona (1965) by changing the density of the interpolation nodes. The simulation was in good agreement with the official map. The average areal-rainfall was calculated by integration. Cumulative rainfall amounts were assumed to be stochastically independent from one season to another. The seasonal precipitations of forty years (1932-1972) were subdivided into five groups to check for binomial distribution. The binomial model fits the historical data adequately. The binomial model for cumulative seasonal arealprecipitation provides one way to compute the return period. This information will be necessary for decision-makers and hydrologists to predict the area's future water balance.

A NOTE ON THE STUDY OF RAINY DAYS AND WET SPELLS AT BIJAPUR,

University of Agricultural Sciences, Bangalore (India). B. V. Rao Ramana, P. S. Kavi, and P. C.

Sridharan.

Annals of Arid Zone, Vol 14, No 4, p 371-372, December, 1975.

Descriptors: *Frequency analysis, *Monsoons, *Wet seasons, *Rainfall, *Climatic data, Rain, Precipitation(Atmospheric), Meteorology, Meteorological data, Weather patterns, Thunderstorms, Storm, Probability. Identifiers: *India(Bijapur).

Bijapur, located in the Indian state of Karnataka. has an annual rainfall of about 59 centimeters received mainly during the months April to December. The daily rainfall data collected at Bijapur for all years from 1921 to 1970 were analyzed to study the distribution of rainy days and wet spells during these months. The frequencies of wet spells of different lengths are estimated monthwise using logarithmic series and the results are discussed. It was found that the southwest monsoon rains persist more in the month of September. Although the probability of occurrence of a rainy day is less during November than in the months of April and May, the persistency is more in November than in April and May. (Jamail-Arizona) W77-08455

2C. Snow, Ice, and Frost

THE AFGWC SNOW COVER ANALYSIS MODEL.

Air Force Global Weather Central, Offutt AFB, Nebr.

S. A. Luces, S. J. Hall, and J. D. Martens Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 942, Price codes: A03 in paper copy, A01 in microfiche. Report AFGWCTM 75-1, June 1975. 22 p, 1 tab, 12 ref, 3 append.

Descriptors: *Snow cover, *Mathematical models, *Computer programs, Analytical techniques, Numerical analysis, Weather data, Remote sensing, Satellites(Artificial), Snow, Sea ice, Climatology, Data collections, Climatic data, Computers, Weather, Model studies, Meteorology. Identifiers: *Snow cover analysis.

This report documented the Air Force Global Weather Central (AFGWC) Automated Snow Cover Analysis Model. It described the data input, analysis procedures, problems, possible improvements, and potential uses of the model. The hemispheric model became operational in March 1975. It uses hourly surface synoptic data, meteorological satellite video brightness data, and climatological data to determine the depth and age of snow on the ground on a hemispheric grid with 25 nautical miles spacing. The resulting daily analyses provide a Northern Hemisphere data base which is stored on high speed computers and is available for many meteorological and other scientific applications. (Sims-ISWS) W77-08223

VERTICAL STRAIN-RATE MEASUREMENTS IN AN ARCTIC ICE CAP AND DEDUCTIONS FROM THEM, Department of Energy, Mines, and Resources, Ot-tawa (Ontario). Polar Continental Shelf Project.

W. S. B. Paterson.

Journal of Glaciology, Vol. 17, No. 75, p 3-12, 1976, 4 fig, 1 tab, 22 ref.

Descriptors: *Ice, *Strain measurement, *On-site tests, *Glaciology, *Arctic, Strain, Velocity, Movement, Measurement, On-site investigations, Rheology, Dating, Analytical techniques, Analysis, Mechanical properties.

Identifiers: *Devon Island Ice Cap(Canada), Ice

Closely spaced measurements of diameter of ther-mally drilled boreholes revealed a pattern of small variations. The patterns served to identify points on the borehole wall; thus the change in length of sections of borehole can be determined as a function of time. The method was used to measure vertical strain-rate as a function of depth in two boreholes near the crest of the Devon Island ice cap. The measured strain-rate, corrected for firn compaction, varied significantly with depth. The vertical component of velocity at the surface was determined from the contraction rate of a borehole that penetrated to the base of the ice. Comparison of this velocity with the present accumulation rate suggested that the ice cap, in the vicinity of the bore-hole, is thickening slightly at present. The age of the ice at various depths, as calculated from the measured vertical velocities, is in broad agreement with radiocarbon dates covering the past 6000 years, which suggests that the flow of the ice cap has not varied significantly over this period. Thus the present accumulation rate, which is causing thickening, must be slightly above the average for the period. (Humphreys-ISWS) W77-08226

RESURVEY OF THE 'BYRD' STATION, AN-TARCTICA, DRILL HOLE,
Cold Regions Research and Engineering Lab.,

Hanover, N.H.

D. E. Garfield, and H. T. Ueda. Journal of Glaciology, Vol. 17, No. 75, p 29-34, 1976. 5 fig, 4 ref.

Descriptors: *Drill holes, *Ice, *Surveys,
Antarctic, On-site investigations, On-site tests,
Instrumentation, Measurement, Descriptors: Movement. Slopes, Analysis. Identifiers: *Byrd Station, Inclinometer, Azimuth.

The drill hole at 'Byrd' station, which was completed in January 1968 to a vertical depth of 7063 ft (1253 m) below the top of the hole casing, was resurveyed in January 1975 to a vertical depth of 4835 ft (1474 m). Inclination and azimuth m surements were made with a Parsons multiple shot inclinometer and were compared with the earlier measurements made during drilling. The results indicated a progressively increasing displacement with depth to a value of 51.2 ft (15.6 m) or about 7.3 ft/year (2.23 m/year) at the 4835 ft (1474 m) level. The direction of movement relative to the surface varies from southwest at 300 ft (91.5 m) to northeast at 1100 ft (335 m) to east at 3368 ft (1027 m) to northeast at 4835 ft (1474 m), indicative of a complex twisting motion. An increase in accessible depth along the hole axis of 18 ft(5.49 m) beyond the 1969 depth was noted. No attempt was made to measure hole diameter or vertical strain. It was recommended that the hole be resurveyed in 3-5 years if it is still logistically feasible, using a more updated inclinometer. (Humphreys-ISWS) W77-08227

A FURTHER COMPARISON OF GLACIER VELOCITIES MEASURED BY RADIO-ECHO AND SURVEY METHODS, British Antarctic Survey, Cambridge (England). . S. M. Doake, M. Gorman, and W. S. B.

Journal of Glaciology, Vol. 17, No. 75, p 35-38, 1976. 1 fig, 7 ref.

Descriptors: *Ice, *Surveys, *Glaciology, *On-site tests, *Arctic, On-site investigations, Velocity, Glaciers, Measurement, Instrumenta-tion, Radar, Remote sensing, Drill holes, Evalua-

tion, Sounding.
Identifiers: *Devon Island Ice Cap(Canada), Ice cap, Radio-echo survey.

A comparison was made between ice velocities that were measured by the radio-echo technique and ice velocities measured by a survey method on the Devon Island ice cap, Arctic Canada. Results were 2.58 + or - 0.11 m/a by radar and 2.17 + or -0.20 m/a by survey. The discrepancy between the two measurements is within the limits of statistical significance, and the methods were considered to give comparable results. (Humphreys-ISWS) W77-08228

RADIO-ECHO SOUNDING OF TEMPERATE GLACIERS: ICE PROPERTIES AND SOUNDER DESIGN CRITERIA, Geological Survey, Denver, Colo. R. D. Watts, and A. W. England. Journal of Glaciology, Vol. 17, no. 75, p 39-48, 10276 Spic Sept.

1976. 5 fig. 5 ref.

Descriptors: *Glaciers, *Sounding, *Electromagnetic waves, Glaciology, Design criteria, Instrumentation, Theoretical analysis, Mathematical studies, Remote sensing, Radio

Identifiers: *Radio-echo sounding, Temperate glaciers, Scattering theory, Back-scattering.

This is the first paper in a two-part series which describes the design, operation, and testing of a successful 5 MHz radio-echo sounder for temperate glaciers. The first part dealt with the electromagnetic characteristics of temperate glaciers at radio frequencies. Earlier workers' problems in sounding through temperate ice were explained in terms of electromagnetic scattering by water-filled voids. The frequency dependence of the scattering indicates that returns from scatterers diminish rapidly at frequencies below about 10 MHz. A system with the following characteristics was recommended: a transmitted pulse with a center frequency of about 5 MHz, duration of about 1 cycle, and a receiver which is untuned and which measures field intensity rather than power. Spectral methods for studying the size distribution of scatterers were presented. (Humphreys-ISWS) W77-08229

RADIO-ECHO SOUNDING: REFLECTIONS FROM INTERNAL LAYERS IN ICE SHEETS, Wisconsin Univ. Middleton. Geophysical and Polar Research Center.

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IER OH Journal of Glaciology, Vol. 18, No. 78, p 3-14, 1977. 4 fig, 19 ref. NSF OPP72-05802.

Descriptors: "Glaciers, "Remote sensing, "Radio waves, "Antarctic, Reflectance, Ice, Snow, Cores, Physical properties, Polar regions, Cold regions, Glaciology. Identifiers: "Ice sheets, "Byrd Station, "Radioecho sounding, Radio-echo reflections, Internal layers, Internal reflections, Permittivity, Layers.

The origin and nature of radio-echo internal reflections were the subjects of much debate. Calculations of single- and multiple-layer reflection coefficients for dielectric changes in the ice sheet indicated that the observed relection strength may result from reflections many thin layers, but the zone of thin layers may best be approximated by replacing the zone with a single thicker layer with average dielectric properties. Calculation of reflections from density changes, dust and diribands, and anisotropy of permittivity indicated bands, and anisotropy of permittivity indicated density variations as the most likely cause of the

internal layering in the uppermost kilometer of ice sheets. Comparison of the depth of internal reflec-tions at 'Byrd' station, Antarctica, with the physi-cal properties of the ice measured in a deep core hole at that location supported the conclusion. (Sims - ISWS) W77-08230

A NEW CLIMATIC MODEL FOR GLACIER BEHAVIOR OF THE AUSTRIAN ALPS, Rider Coll., Trenton, N.J. Dept. of Geosciences.

H. W. Posamentier.

Journal of Glaciology, Vol. 18, No. 78, p 57-65, 1977. 3 fig, 1 tab, 18 ref.

Descriptors: *Glaciers, *Climatic data, *Model studies, Mathematical models, Ablation, Temperature, Air temperature, Precipitation(Atmospheric), Regression analysis, Correlation analysis, Mountains, Ice, Weather, Weather data, Meteorological data, Glaciology, Meteorological

gy, Foreign countries. Identifiers: *Austria.

Two climatic models were proposed for the fluctuation of Austrian Alpine glacier termini. The glacier record, based on annual observations by the Osterreichische Alpenverein, is related to climatological data from the high-elevation Sonnblick-Observatorium. The variables used in this analysis were monthly mean temperature and total precipitation during the ablation season for the concurrent plus preceding eleven years. The preferred model, mean temperature for June, July, and August for the concurrent plus preceding seven years, is inversely related to glacier ad-vance. This model was derived by combining those variables with the highest correlation coefficient relative to the glacier record. Mean lag time between climate and glacier termini response seems to be seven years. The second and less preferred model was derived by multiple regression analysis and includes seven variables of temperature and precipitation. Variation in the glacier behavior record accounted for by the two models is 71% and 67%, respectively. (Sims-ISWS) W77-08235

STRESS IN AN ELASTIC BEDROCK HUMP DUE TO GLACIER FLOW, University of East Anglia, Norwich (England). School of Mathematics and Physics. L. W. Morland, and E. M. Morris.

Journal of Glaciology, Vol. 18, No. 78, p 67-75, 1977. 10 fig, 6 ref.

Descriptors: *Glaciers, *Bedrock, *Stress, Flow, Ice, Loads(Forces), Strain, Model studies, Mathematical models, Failures, Rocks, Glaciology. Identifiers: *Bedrock humps, Glacial flow

The stress field is an isotropic elastic hump Ine stress field is an isotropic elastic hump representing a typical bedrock feature was obtained for plane strain conditions. Gravity effects were included, and the applied load is a normal pressure distribution deduced from an idealized model of glacier flow. A Coulomb failure criterion was applied, including (1) the effective stress change due to pore water pressure, and (2) stresses on the predicted failure planes determined for different pressure amplitudes and relative areasity. on the predicted fature planes determined for dif-ferent pressure amplitudes and relative gravity contributions. The latter make little difference to the maximum 'failure stress', but they influence the regions where such stress levels occur. Levels of cohesive stress required to inhibit Coulomb failure were obtained and in general, were low, im-plying that coherent rock in the adopted hump profile, subject to the model pressure, would not fail. This profile is stable unless jointing introduces an easier failure mechanism. (Simstructure) ISWS)

IMPURITY CONCENTRATIONS IN SEA ICE, McGill Univ., Montreal (Quebec). Dept. of J. R. Addison. Journal of Glaciology, Vol. 18, No. 78, p 117-127, 1977. 6 fig, 1 tab, 26 ref.

Descriptors: *Sea ice, *Chemical analysis, *Laboratory tests, *Testing, Analysis, Analytical techniques, Ions, Profiles, Distribution patterns, vater, Melt water, Sampling, Ice, Chemicals, Chlorides, Sulphates, Sodium, Potassium, Magnesium, Calcium. Identifiers: Ion concentrations.

Three different types of saline ice were cut into sections a few millimeters thick along planes parallel to the surface. The resulting melts were analyzed quantitatively for chloride, sulphate, sodium, potassium, magnesium, and calcium. Two of the specimens were artificial sea ice, grown in the laboratory at ambient temperatures of -30 C and -15 C, respectively. A portion of the latter exhibited a clear, glassy, fresh-ice structure. The third specimen was natural sea ice. The resulting ion concentration profiles and ion ratios were presented. For sections of widely varying salinity, the various ion ratios assumed values fairly close to those in natural seawater. (Humphreys-ISWS)

MEASUREMENT OF ICE MOVEMENT IN SUB-GLACIAL CAVITIES: A NEW CAVITOMETER BENEATH THE GLACIER D'ARGENTIERE (MT BLANC, FRANCE),
Grenoble-1 Univ. (France). Institut de Geographie

G. Bocquet, and J. C. Ricq. Journal of Glaciology, Vol. 18, No. 78, p 137-142, 1977. 4 fig, 3 ref.

Descriptors: *Glaciers, *Movement, *Instrumentation, Equipment, Mechanical equip-Descriptors: ment, Electrical equipment, Measurement, Surveys, Ice, Foreign countries, Foreign research, Engineering, Glaciology. Identifiers: *Cavitometers, *France, *Glacier d'Argentiere(France), Glacial flow, Subglacial

The study of subglacial movements taking place in regions of cavitation beneath the Glacier several cavitometers. The very unusual conditions in which such apparatus is installed to measure simultaneously the velocity and the position of the ice vault led to the design and production of a prototype of a portable cavitometer which records the data on magnetic tape (cassettes). (Sims-ISWS) W77-08238

ON DEPTH HOAR AND THE STRENGTH OF

SNOW, Montana State Univ., Bozeman. Dept. of Earth

Sciences. C. C. Bradley, R. L. Brown, and T. Williams. Journal of Glaciology, Vol. 18, No. 78, p 145-147, 1977. 6 ref. AROD DA-ARO-D-31-124-71-G59, NSF FA-3943.

Descriptors: *Snow, *Snowpacks, *Frost, Strength, Mechanical properties, Bearing strength, On-site investigations, Temperature, Thermal conductivity, Snow cover, Crystals. Identifiers: *Depth hoar, Snow strength, Metamorphism, Recrystallization, Geothermal

It has long been known that a temperature gradient in the snowpack, when temperatures are less than O C, can metamorphose the snow to produce a fragile euhedral crystalline end product called depth hoar' which is considered to be responsible oepin noar winch is considered to be responsioned for snowpack collapse and climax avalanches. The wave of metamorphism advancing through an-hedral snow converts it first to subhedral, and finally to euhedral, depth hoar. Field observations, which are at the moment supported by laboratory

Field 2-WATER CYCLE

Group 2C-Snow, Ice, and Frost

evidence, revealed that the zone of minimum snow strength in the gradient metamorphic layer is as-sociated with the intermediate subhedral phase rather than with the euhedral end product. (Sims-W77-08239

RELOCATION OF BURIED MARKERS. British Columbia Univ., Vancouver, Dept. of Geological Sciences. W. H. Mathews.

Journal of Glaciology, Vol. 18, No. 78, p 150-151, 1977. 2 ref.

Descriptors: *Stations, *Relocation, *Remote sensing, *Glaciers, Glaciology, Electronic equipment, On-site Investigations.

Identifiers: *Buried markers, Electromagnetic detector.

Success was achieved in relocating wire netting which had been covered by a year's net accumula tion of snow on Berendon Glacier. A signal produced by a wire loop tuned to respond to a 15 kHz electromagnetic output was detected readily by a hand-held, battery-powered electromagnetic detector. Sextant readings on fixed landmarks around the glacier aided in locating the search area. (Humphreys-ISWS) W77-08240

THE FLOODING OF RIVERS IN THE USSR AND THE MEASURES TAKEN TO CONTROL ICE JAMS (LES INONDATIONS FLUVIALES EN URSS ET LA LUTTE CONTRE LES CRUES CAUSEES PAR LES EMBACLES),

Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.

K. S. Lubomirova

In: Flash Floods: Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 110-113, 1974, 5 ref.

*Floods, *Ice jams, *Rivers, Descriptors: *Reservoirs, Ice, Flooding, Reservoir operation, Hydroelectric plants, Frazil ice, Ice breakup, Foreign countries, Foreign research. Identifiers: *USSR.

The flooding of streams and rivers of different regions of the USSR is classified according to the cause of the flood. The time lag involved in the breaking up of ice in rivers and reservoirs often causes ice jams and frazil ice in upstream reaches of the reservoirs, which results in high stages. Similar situations are found on rivers which have constrictions, tight bends, etc. However, in the described case, the places where ice jams are most likely to occur are known and so preventive measures can be taken. In order to control the ice regime downstream from reservoirs which are linked to large rivers, it was recommended that large amounts of warm water should be injected. It was proposed that at the time of constructing the cascades of hydrological power plants situated on rivers subjected to ice jams, the outflows should be made to open in succession upstream and downstream. Therefore, it would be possible to control the ice regime over a large river reach as power plants need only be constructed on every other cascade. (See also W77-01933) (Humphreys-W77-08246

DELINEATION OF THE BOUNDARIES OF A BURIED PRE-GLACIAL VALLEY WITH LAND-SAT-1 DATA, Purdue Univ., Lafayette, Ind.

For primary bibliographic entry see Field 2G. W77-08415

COMBINED ICE AND WATER BALANCES OF MACLURE GLACIER, CALIFORNIA, SOUTH CASCADE GLACIER, WASHINGTON, AND WOLVERINE AND GULKANA GLACIERS, ALASKA, 1967 HYDROLOGIC YEAR, Geological Survey, Anchorage, Alaska. Water

Pesources Div. W. V. Tangborn, L. R. Mayo, D. R. Scully, and R.

M. Krimmel.

Available from Supt. of Documents, GPO, Washington, D.C., 20402, price \$3.90. Professional Paper 715-B, 1977. 20 p, 9 fig, 4 plates, 8 tab, 14

Descriptors: *Glaciers, *Ice, *Water balance,

Identifiers: *Maclure Glacier(Calif), *South Cascade Glacier(Wash), *Wolverine and Gulkana

Combined ice and water balances were measured in the 1967 hydrologic year (October 1-September 30) on four glaciers in western North America ranging in latitude from 37 degrees to 63 degrees N. This hydrologic year was characterized by heavier than normal winter precipitation in California and Washington and abnormally dry winter conditions in coastal Alaska. In summer the western conterminous states were abnormally dry and central and southern Alaska experienced very wet conditions. Maclure Glacier (lat 37 deg 45 min N., 3,650-m (meters) mean equilibrium line altitude) had an above normal winter balance of 3.46 m and a positive annual balance of 1.05 m (meters of water equivalent). South Cascade Glacier (lat 48 deg 22 min N., 1,900-m mean equilibrium line altitude) had a winter balance of 3.28 m, slightly above average. Above normal summer ablation resulted in a final annual balance of -0.58 m, slightly more negative than has been the case for the past decade. Wolverine Glacier's (lat 60 deg 24 min N., 1,200-m mean equilibrium line altitude) winter balance was 1.17 m, considerably below normal; the annual balance was -2.04 m. Gulkana Glacier (lat 63 deg 15 min N., 1,700-m mean equilibrium line altitude) had a winter balance of 1.05 m, approximately normal for this glacier; the final annual balance was -0.3-0 m. (Woodard-USGS)

2D. Evaporation and Transpiration

ESTIMATING EVAPOTRANSPIRATION IN THE NORTH PLATTE BASIN OF WYOMING, Wyoming Univ., Laramie. Dept. of Agricultural

Engineering. R. W. Van Klaveren.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 623, Price codes: A03 in paper copy, A01 in microfiche. M.S. Thesis, June 1975. 60 p, 8 tab, 32 fig, 22 ref. OWRT A-014-WYO(1), 14-31-0001-5051.

*Evapotranspiration, *Phreatophytes, Methodology, *Consumptive use, *Wyoming, River basins, Estimating, Water use. Identifiers: *Potential evapotranspiration, *North

Platte River Basin(Wyo).

Methods of calculating potential evapotranspira-tion were compared and estimates of phreatophyte water use were made for the North Platte River Basin of Wyoming. Three methods of estimating potential evapotranspiration, the Jensen-Haise, Thornthwaite, and Blaney-Criddle, were evaluated and compared to adjusted pan evaporation. By a simple modification of the Thornthwaite equation, the most favorable correlation of potential evapotranspiration with pan data was acquired. Average annual phreatophyte evapotranspiration was estimated using the Blaney-Criddle method. The estimated total longterm annual evapotranspiration for phreatophytes was 8.121 hectare-meters for the four major rivers consisting of the North Platte, Laramie, Medicine Bow, and Sweetwater. W77-08505

2E. Streamflow and Runoff

MEASUREMENT OF FLASH FLOODS IN THE UNITED STATES--STATE OF THE ART, Geological Survey, Reston, Va. Water Resources

In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No 112, p 48-51, 1974, 10 ref.

Descriptors: *Floods, *Measurement, *Analytical techniques, *Reviews, Stream gages, Instrumentation, Crest-stage gages, Current meters, Culverts, Indirect flood measurement, Hydrographs, Discharge(Water), Flow rates, Mannings equation, Computer programs, United States.

During the past two decades the US Geological Survey has devoted a significant part of its total water resources appraisal effots to the measurement of floods in small basins. On the most important considerations in the development of all the State programs is the difficulty in measuring flood discharges. Most of the floods which occur at station sites over a large part of the country are produced by severe thunderstorm activity of limited areal extent. The inability to forecast the time and place of occuurrence of storms in advance, and the short time of concentration and storm duration, limits the probability of obtaining conventional current-meter measurements. As a consequence the changes in philosophy, instrumentation, equipment, and operational procedures during this period have been significant. This paper reviews the changes which have occurred during the past 20 years, and describes current practices employed in the measurement of floods. (See also W77-01933) (Woodard-USGS)

SIMULATION OF STREAMFLOW OF FLAM-BEAU RIVER AT PARK FALLS, WISCONSIN TO DEFINE LOW-FLOW CHARACTERISTICS, Geological Survey, Madison, Wis. Water Resources Div. W. R. Krug.

Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-265 353/AS, Price codes: A02 in paper copy, A01 in microfiche. Water-Resources Investigations 76-116, December 1976. 14 p, 7 fig, 2 tab, 4 ref.

Descriptors: *Streamflow forecasting, *Routing, *Low flow, *Simulation analysis, *Flow characteristics, Computer models, Open channel flow, Analytical techniques, Evaluation, *Wisconsin. *Flambeau River(Wis), Identifiers: Falls(Wis).

Daily streamflows of the Flambeau River at Park Falls, Wisconsin, were simulated for a 31-year period. Streamflow was simulated using a streamflow-routing model. These simulated daily flows were analyzed for summer (June 1-October 31) low-flow frequency. The resultant 7-day, 10-year summer low flow is 260 cubic feet per second. The standard error of estimate for this 10-year-frequency low flow is equivalent to the standard error of estimate for 16 years of gaging-station records. (Woodard-USGS) W77-08172

Streamflow and Runoff-Group 2E

HYDROLOGIC EFFECTS OF THE TAMPA BYPASS CANAL SYSTEM, Geological Survey, Tallahassee, Fla. Water Resources Div. For primary bibliographic entry see Field 4A.

THE INFLUENCE OF PRECIPITATION ON BIOCHEMICAL OXYGEN DEMAND ON NINE STREAMS IN NEW JERSEY, Rutgers - The State Univ., New Brunswick, N.J.

Dept. of Geography.
For primary bibliographic entry see Field 5B.
W77-08203

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EFFECTS OF MEANDERING IN ALLUVIAL STREAMS, Battelle-Pacific Northwest Labs. Richland, Wash.

Battelle-Factic Northwest Labs. Richland, Wash. Y. Onishi, S. C. Jain, and J. F. Kennedy. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY7, Proceedings Paper 12248, p 899-917, July 1976. 6 fg. 3 tab, 19 ref. 3 append. OWRT A-029-IA(5), USDA-ARS 12-14-100-104(38).

Descriptors: *Meanders, *Alluvial channels, *Sedimentation, *Beds, Channels, Curves, Erosion, Friction, Open channel flow, Rivers, Equa-

ston, Fletton, Open channel flow, Rivers, Equa-tions, Sediment transport. Identifiers: *Alluvial streams, *Bed forms, Bends(Hydraulic), Friction factor, Secondary flow, Sediment deposits, Meandering channel, Sediment transfer.

For a given mean depth and velocity of flow, the sediment discharge per unit width in the full-width meandering channel was found to be greater than that in the straight flume, which in turn was greater than that of the half-width meandering channel. The bend-loss coefficient, defined as the head loss (plus or minus) due only to channel cur-vature normalized by the mean-velocity head, increased with Froude number, the ratio of bed hydraulic radius to median sand diameter, and the ratio of width to center line radius of curvature. At the smaller depths investigated, the friction facthe smaler depths investigated, the riccion ractions of the sinuous channel flows were less than those of the straight channel flows. These effects apparently resulted primarily from the large changes produced in the bed configurations by the secondary flows. (Roberts-ISWS) W77-08216

APPLICATION OF THREE DAILY-RAINFALL RUNOFF MODELS TO FOUR AUSTRALIAN CATCHMENTS, Monash Univ., Clayton (Australia). Dept. of Civil

For primary bibliographic entry see Field 2A. W77-08218

LOW FLOW ANALYSES OF STREAMS: DETAILS OF COMPUTATIONAL DETAILS OF COMPUTATIONAL PROCEDURES AND ANNOTATED BIBLIOG-RAPHY

Monash Univ., Clayton (Australia). Dept. of Civil Engineering. T. A. McMahon.

Research Report No. 5/1976, November 1976. 60 p, 9 fig, 1 tab, 31 ref, append. (148 ref).

Descriptors: *Reviews, *Low flow, *Streamflow, *Regional analysis, Forecasting, Low-flow frequency, Bibliographies, Watersheds(Basins), Statistical methods, Discharge(Water), Hydrology, Analytical techniques, Analysis, Water storage, Water yield, Frequency curves, Hydrologic data, Recession curves, Streamflow forecastics

The several aspects of low stream flow reviewed included: (1) data, data extension, estimation of historical flows, adjustments of flow characteristics, and discharge measurements at an un-

gauged site; (2) frequency distribution and parameter specification, measures of central ten-dency, varibility and skewness, and persistnce; (3) analysis of low flow characteristics, flow duration analysis, uses of flow duration curves, low flow frequency curves, annual frequency series, partial frequency series, transition probability matrix of low flows, uses of low flow frequency curves, recession analysis, uses of recession analysis, and flow interval approach; (4) storage-yield analysis; Gould's storage yield procedure, and use of storage-yield relationships; (5) low flow forecasting, and (6) regionalization, regional analysis, and use of regional analysis. The appendix, and anotated bibliography of papers and reports dealing exclusively or in part with low flow analysis, contained 148 entries. (Humphreys-ISWS) W77-08219

FLASH FLOODS IN THE WESTERN MEDITER-RANEAN (LES CRUES CATASTROPHIQUES SUR LA MEDITERRANEE OCCIDENTALE), Servicio Meteorologico Nacional, Madrid (Spain). J. Miro-Granada y Gelabert.

In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112,

p 119-132, 1974, 11 fig, 9 ref.

Descriptors: *Flash floods, *Weather patterns, *Meteorology, *Rainfall disposition, Historic Meteorology, Kannian disposition, Historic floods, Precipitation(Atmospheric), Precipitation excess, Rainfall, Runoff, Orography, Isohyets, Analysis, Analytical techniques, Synoptic analy-sis, Foreign research, Foreign countries. Identifiers: *Spain.

Along the Spanish Mediterranean coast, the rivers have short, steep gradients and, due to the semiarid climate, are often dried up or have only low discharges. Flash floods occur in this area principally in the autumn because during autumn, extensive storm nuclei build up, resulting in ex-tremely heavy rainfall. The storm nuclei form because the Mediterranean is a source of heat energy and water vapor and because well-developed convective cells prevail, together with some other characteristic meteorological condi-tions. The flood of October 1973 on the southeast coast of Spain was studied. The genesis of the phenomenon is considered to be the coincidence of several factors: the maximum temperature of the shallow coastal seawater; a zone of air flow forked into two branches, one crossing the western Mediterranean from the southwest; and the orographical characteristics of the basin. The result was a divergence at 500 mb with a southwest flow and convergence at surface level where there were easterly winds. A vortex with a horizontal axis was set up. Comparisons were made between the storm rainfall and the average annual precipita-tion. It was shown that both the rain gauge and synoptic networks were inadequate to detect such nuclei so that flood warnings can be issued and possible damage minimized. The use of radar station sites was discussed. (See also W77-01933) (Humphreys-ISWS) W77-08245

THE FLOODING OF RIVERS IN THE USSR AND THE MEASURES TAKEN TO CONTROL ICE JAMS (LES INONDATIONS FLUVIALES RE JAMS (LES INVIDIATIONS FLUVIALES EN URSS ET LA LUTTE CONTRE LES CRUES CAUSEES PAR LES EMBACLES), Akademiya Nauk SSSR, Moscow. Institut Vod-nykh Problem.

For primary bibliographic entry see Field 2C. W77-08246

FLASH FLOODS IN SPAIN (LES CRUES BRU-TALES EN ESPAGNE),

Consejo Superior di Investigaciones Cientificas, Madrid (Spain). Instituto de Hidrologia.

In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 93-99, 1974. 5 fig. 1 tab, 4 ref.

Descriptors: *Flash floods, *Flood discharge, *Watersheds(Basins), *Analytical techniques, Analysis, Rainfall excess, Precipita-Analysis, Rainfall excess, Precipitation(Atmospheric), Meteorology, Statistical methods, Rainfall disposition, Runoff, Foreign countries, Foreign research.

Because of the immense irregularity of Spanish rivers, there is a large contrast between critically small low flows and maximum flood discharges as great as, and even greater than, the greatest floods recorded in Europe. The River Duero flood in 1909 may be one of the best known in western Europe for basins exceeding 1000 sq. km. The flood of small basins in the Mediterranean region and the Canary Isles are of the same magnitude as the most severe ones in the world. In view of the complexity of the maximum flood phenomenon, in particular the sudden, severe, catastrophic ones that occur in small basins, it is difficult to estimate that occur in small basins, it is difficult to estimate the distribution of maximum precipitation and flood discharges using hydrological-statistical methods. The difficulty exists because the phenomena happen at irregular intervals in vast zones both on the Spanish mainland and on the Islands of Spain. However, using all existing information, including historical data, which in some cases have been specified for mere than 300 years. cases have been recorded for more than 300 years, the distribution laws were obtained by using direct, empirical, statistical and hydrometric methods. (See also W77-01933) (Humphreys-(SWS) W77-08247

THE OPERATION OF A FLOOD WARNING NETWORK: ITS USE FOR STUDYING FLASH FLOODS (EXPLOITATION D'UN RESEAU D'ALERTE: SON UTILISATION POUR L'ETUDE DES CRUES BRUTALES),

Division des Resources en Eau, Tunis (Tunisia). H. Zebidi, and R. Kallel.

In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 57-61, 1974. 1 fig.

Descriptors: *Warning systems, *Flash floods, *Networks, *Africa, Forecasting, Hydrologic data, Watersheds(Basins), Flood forecasting, Communication, Radio communication, Foreign countries. Identifiers: *Tunisia, Wadis, *Flood warning net-

The dry climate which is found in most of Tunisia takes the form of particularly irregular flow pat-terns on the hydrographic network. The flow pat-terns are characterized by very low water levels and by sudden and violent floods. In addition to the difficulties of measuring the flood, devastating the difficulties of measuring the Hood, devastating effects also result on the coastal plains and in the low zones which are crossed by the different wadis. Therefore, it was necessary to create a flood warning network, parallel to the hydrometric network, so that the different gauging stations can be reached in the time, and so that the civil authorities might be warned in time to avoid flood without the first t damage and loss of life. Of course, the flood warndamage and loss of life. Of course, the flood warning network is always in direct contact with the Dam Control Service. The flood warning network operates by means of two-way radio contact as well as through a telephone link between the Central Bureau of Tunis (which is always open) and regional bureaus, which assemble the data from different basins and hydrometric stations set up at the nerve centers of the different wadis of the country. (See also W77-01933) (Humphreys-ISWS) W77-08248

Field 2-WATER CYCLE

Group 2E—Streamflow and Runoff

A METHODOLOGY FOR MEASURING FLASH FLOODS (METHODOLOGIE POUR LA ME-SURE DES CRUES BRUTALES), Office de la Recherche Scientifique et Technique

Outre-Mer, Paris (France).

In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 34-43, 1974. 2 fig, 1 append.

Descriptors: *Flash floods, *Measurement, *Methodology, Organizations, Gaging stations, Sites, Flood discharge, Discharge(Water), Topography, Watersheds(Basins), Analytical techniques, Foreign countries, Foreign research. Identifiers: *France, Flow charts.

Measuring flash floods is a very difficult operation, particularly when the greatest discharges are considered. With the aid of his own experience in this field, the author has tried to build a specific methodology. The methodology consists of a perpetual research into the best possible organization. All the operations retained for every elementary task are reconsidered systematically as soon as a new event brings supplementary information. The described approach was illustrated by two flow charts. Experience has shown also that all the measuring techniques used in the case of the most regular regimes have to be revised. In order to show the significance of the methodology, it was essential to mention some especially important Humphreys-ISWS)
W77-08249

RECENT FLASH FLOODS OF THE DISON BROOK (CRUES BRUTALES RECENTES DU 'RUISSEAU' DE DISON (BELGIQUE): OBSER-VATIONS ET PREVISIONS).

Liege Univ. (Belgium), Faculte des Sciences Ap-

pliquees. For primary bibliographic entry see Field 4A. W77-08250

EFFECT OF LATERAL INFLOW ON STEADY OPEN CHANNEL FLOWS,

Connecticut Univ., Storrs.

H. K. Soong. Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 925, Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1976. 104 p, 8 tab, 29 fig, 28 ref. OWRT A-051-CONN(2), 14-31-0001-3507.

Descriptors: *Open channel flow, *Flow characteristics, *Momentum equation, *Energy equa-tion, *Nonuniform flow, *Energy loss, Design. Identifiers: *Lateral inflow, *Streamwise variation, Mixing loss, Design methods.

By a critical examination of one-dimensional open channel flow analysis, it can be shown that a single momentum or energy equation as widely used in the past is not sufficient to explain certain anomalies in the nonuniform flow region. Additional equations are necessary for evaluating energy and mixing losses. In this study these equations are developed and shown to be satisfactory in matching exprimental results. Furthermore, the streamwise variation of momentum and energy correction factors determined from the following two methods: (1) a direct numerical integration of momentum and energy flux across a section of open channel, obtained from the measured velocity distributions, and (2) a numerical solution of the momentum and energy equations for the correction factors, utilizing the flow variable derived from experimental data, is shown to be a pertinent parameter for the nonuniform flow field. The results should further the understanding of the flow behavior in the mixing region and provide a scheme of open channel flow analysis to improve design methods. (de Lara-Connecticut) W77-08290

REGIONAL SIMULATION OF STREAMFLOW

DATA, North Carolina Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2A.

FLOODS OF NOVEMBER 12, 1974, IN THE CHARLOTTE AMALIE AREA, ST. THOMAS, U.S. VIRGIN ISLANDS,

Geological Survey, Miami, Fla. Water Resources Div.; and Geological Survey, San Juan (Puerto Rico). Water Resources Div. For primary bibliographic entry see Field 7C. W77-08470

HYDROLOGIC UNIT MAP-1974, STATE OF

Geological Survey, Reston, Va. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-08474

HYDROLOGIC UNIT MAP-1974, STATE OF

Geological Survey, Reston, Va. Water Resources

For primary bibliographic entry see Field 7C. W77-08475

HYDROLOGIC UNIT MAP--1974, STATE OF SOUTH DAKOTA.

Geological Survey, Reston, Va. Water Resources For primary bibliographic entry see Field 7C.

W77-08476

W77-08477

HYDROLOGIC UNIT MAP--1974, STATE OF

Geological Survey, Reston, Va. Water Resources For primary bibliographic entry see Field 7C.

SMALL-STREAM FLOOD INVESTIGATIONS IN MINNESOTA, OCTOBER 1958 TO SEP-

TEMBER 1975, Geological Survey, St. Paul, Minn. Water Resources Div.

L. C. Guetzkow, and K. T. Gunard. Open-file report 77-39, December 1976. 161 p, 8

Descriptors: *Flood data, *Small watersheds, *Minnesota, *Peak discharge, Design criteria, Drainage systems, Road construction, Hydrologic data, Gaging stations, Streamflow, Flow characteristics, Stage-discharge relations.
Identifiers: *Basin characteristics.

An investigation of flood flows from small drainage basins in Minnesota was initiated to aid in the design of bridges, culverts and other highway drainage structures. The program provides peak flow data on streams having drainage areas generally less than 50 square miles, placing pargenerally less than 50 square miles, placing par-ticular emphasis on those less than 10 square miles. Basin parameters being investigated are drainage area, length of main stream, slope of main channel, basin altitude, forest cover, and storage area. Each of the 138 gaging stations are equipped with crest-stage gages, and 10 stations have continuous recorded records of stage and precipitation. The relative magnitude of flood precipitation. The relative magnitude of flood flows for different hydrologic regions are shown in graphs which relate maximum discharge to drainage area. Each station record contains location, drainage area, records available, type of gage, on-site structure elevations, bankfill stage, and annual maximum stage and discharge data (Woodard-USGS) W77-08481

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1976,

Geological Survey, Helena. Mont. Water Resources Div.

M. V. Johnson, R. J. Omang, and J. A. Hull. Open-file report 77-172, March 1977. 204 p, 2 fig.

Descriptors: *Annual peak discharge, *Small watersheds, *Floods, *Montana, Crest-stage gages, Streamflow, Surface runoff, Design criteria, Highways, Hydrologic data.

Annual peak discharge from small drainage areas is tabulated for 336 sites in Montana. The 1976 additions included data collected at 206 sites. The program which investigates the magnitude and requency of floods from small drainage areas in Montana, was begun July 1, 1955. Originally 45 crest-stage gaging stations were established. The purpose of the program is to collect sufficient peak-flow data, which through analysis could provide methods for estimating the magnitude and frequency of floods at any point in Montana. The ultimate objective is to provide methods for estimating the 100-year flood with the reliability needed for road design. (Woodard-USGS) W77-08482

2F. Groundwater

SELECTED WATER-LEVEL RECORDS FOR WESTERN OKLAHOMA, 1950-1975, Geological Survey, Oklahoma City, Okla. Water

For primary bibliographic entry see Field 7C. W77-08163 Resources Div

GROUND-WATER DATA FOR 1974-75 IN JOSHUA TREE NATIONAL MONUMENT, CALIFORNIA,

Geological Survey, Menlo Park, calif. Water Resources Div. For primary bibliographic entry see Field 7C. W77-08164

WATER RESOURCES OF THE MYAKKA RIVER BASIN AREA, SOUTHWEST FLORIDA, Geological Survey. Tallahassee. Fla. Water Geological Survey, Resources Div.
For primary bibliographic entry see Field 4B. W77-08167

GROUND-WATER RESOURCES OF VAN-

DERBURGH COUNTY, INDIANA, Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, St. Paul, Minn. Water Resources Div. For primary bibliographic entry see Field 4B. W77-08170

GROUND WATER IN THE SAN JUAN METROPOLITAN AREA, PUERTO RICO, Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div. For primary bibliographic entry see Field 4B. W77-08173

GEOHYDROLOGY OF THE ENGLISHTOWN FORMATION IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,

Geological Survey, Trenton, N.J. Resources Div.

Water Resources Investigations 76-123 (Open-File Report), February 1977. 62 p. 21 fig, 9 tab, 33 ref.

*Aquifer Descriptors: *Hydrogeology, *Hydrologic properties, *New Jersey, *Atlantic Coastal Plain, Well data, Water levels, Pumping, Drawdown, Specific capacity, Hydraulic conductivity, Transmissivity, Groundwater recharge, Specific gravity. Identifiers: *Englishtown formation(NJ), Specific storage.

The geohydrologic data in this report are the basic requirements needed in the development of a computer simulation model of the most developed part of the Englishtown aquifer in the northern Coastal Plain of New Jersey. The Englishtown aquifer, which has an average thickness of about 100 feet throughout Monmouth and northern Ocean Counties, is sandwiched between overlying and underlying confining beds that have an average thickness of 40 ft and 200 ft respectively. The transmissivity of the aquifer is relatively low, ranging from 2,400 sq ft/d to 650 sq ft/d; the hydraulic conductivity averages about 15 ft/d. The average rate of withdrawal study increased from 5.5 mgd in 1959 to about 9.5 mgd in 1970. The effect of this withdrawal rate was a decline in head so of 1970 at a rate of 8 to 12 ft per year over large areas. As a consequence of this change in head, large quantities of water have apparently leaked from and through the confining layers into the Englishtown aquifer. The quantity of leakage and the effects of future stresses on the aquifer can best be estimated by simulation modeling. (Woodard-USGS)

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GEOHYDROLOGY OF THE ALBIN AND LA GRANGE AREAS, SOUTHEASTERN WYOM-

ING, Geological Survey, Cheyenne, Wyo. Water Resources Div. For primary bibliographic entry see Field 4B. W77-08176

EFFECT OF DIP ON THE SUBSURFACE STORAGE OR DISPOSAL OF FLUID IN SALINE AQUIFERS,

Louisiana Water Resources Research Inst., Baton Rouge. For primary bibliographic entry see Field 4B. W77-08204

EFFECT OF VISCOSITY RATIO ON THE RECOVERY OF FRESH WATER STORED IN SALINE AQUIFERS,

Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering. For primary bibliographic entry see Field 4B. W77-08205

DIAGENESIS OF MIDDLE AND UPPER EOCENE CARBONATE SHORELINE SEQUENCES, CENTRAL FLORIDA. Florida Univ., Gainesville. Dept. of Geology. A. F. Randazzo, G. C. Stone, and H. C. Saroop.

A. F. Randazzo, G. C. Stone, and H. C. Saroop. Reprint from The American Association of Petroleum Geologists Bulletin, Vol. 61, No. 4, p 492-503, April, 1977. 14 fig. 2 tab, 41 ref. OWRT B-032-FLA(1), 14-34-0001-7148.

Descriptors: *Groundwater movement, *Porosity, *Permeability, *Groundwater resources, *Aquifer management, *Limestones, *Petrography, *Water management(Applied), *Aquifers, *Facies, *Diagenesis.

Petrographic analysis of 14 cores penetrating the Inglis and Avon Park Formations (Floridan aquifer) reveals several distinct lithofacies representing multiple regressive-transgressive cycles, aerial exposure, and diagenesis. Evolution of pore space varies with the lithofacies and is a function of primary deposition and diagenetic history. The general tendency has been toward obliteration of primary voids by compaction and calcite and dolomite infilling, but several zones show dissolution enlargement. There is evidence for penecontemporaneous dolomitization in a supratidal environment, as well as post-depositional

dolomitization by Mg-rich ground-water flushing. Various dolomite textures can be used to predi the environment of dolomitization. These textures (1) replacement dolomitization of the total sediment so that original fabrics are preserved; (2) dolomitization by aggrading nemorphic processes; and (3) replacement dolomitization of fossils and pellets only. Other diagenetic processes which have affected the lithofacies include dissolution, recrystallization and inversion, and several phases of calcite cementation. The hydrologic regime and the original texture of the carbonate rock con trolled the types of cement present. Scalenohedral crystals have been precipitated from marine waters along the test walls of internal chambers of fossils. Small, equant, blocky crystals have precipitated from meniscus fluid in the vadose zone of ground water as coatings along internal chamber walls of fossils and at the contacts between grains. W77-08208

APPLICATIONS OF SURFACE RESISTIVITY METHODS.

ME I HOUS, Alberta Univ., Edmonton. Dept. of Geology. F. W. Schwartz, and G. L. McClymont. Ground Water, Vol. 15, No. 3, p 197-202, May-June 1977. 5 fig, 10 ref.

Descriptors: *Groundwater, *Surveys, *Resistivity, *Canada, Geology, Geophysics, Rock properties, Conductivity, Electrical resistance, Borehole geophysics, Sandstones, Glacial drift, Aquifers, Groundwater potential, Groundwater resources, Hydrogeology. Identifiers: *Alberta(Canada).

Generally, the geology of the Breton area of Alberta consists of a 5- to 125-ft veneer of glacial till overlying sandstone and sandy shale units of the Paskapoo Formation. These sandstone units are locally important aquifers. Glacial drift in the Hastings Lake area varies in thickness from 100 to 200 ft and overlies the Horseshoe Canyon Formation, which consists of bentonitic shale, siltstone, and coal units with minor sandstone units. Groundwater yields from drift and bedrock in this area are generally less than 30 gpm (113.6 1/m). Resistivity sounding were completed at 68 and 65 stations in the Breton and Hastings Lake areas, respectively. Profile maps from the Breton area are characterized by broad areas with apparent resistivity values greater than 100 ohm-ft. Qualitative evaluation of the resistivity soundings and existing borehole data indicated that the high resistivity values resulted from a thick resistive sandstone aquifer less than 25 ft from ground surface. A reasonably well-defined resistivity pattern was evident on the profile maps of the Hastings Lake area, with the highest resistivity values com-ing from stations located in the hummocky moraine south of the lake. In addition to providing useful information on the geology of an area, surface resistivity methods provide a rapid and relatively inexpensive tool to aid in planning more detailed groundwater studies because of their ability to detect inhomogeneities in the subsurface environment. (Sims-ISWS) W77-08244

EFFECT OF DIP ON THE STORAGE OF FRESH WATER (OR THE DISPOSAL OF WASTE) IN A SALINE AQUIFER, Louisiana State Univ., Baton Rouge. Dept. of

Louisiana State Univ., Baton Rouge. Dept. o Civil Engineering. For primary bibliographic entry see Field 4B. W77-08288

WATER-LEVEL DECLINE AND PUMPAGE IN DEEP WELLS IN THE CHICAGO REGION, 1971-1975,

Illinois State Water Survey, Urbana. R. T. Sasman, C. R. Benson, J. S. Mende, N. F. Gangler, and V. M. Colvin. Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 911, Price codes: A03 in paper copy, A01 in microfiche. Circular 125, 1977. 35 p, 8 fig, 4 tab, 12 ref, 1 append.

Descriptors: *On-site data collections, *Illinois, *Groundwater, *Water wells, *Deep wells, Water levels, Well data, Water sources, Groundwater mining, Water yield, Discharge(Water), Aquifers, Geology, Hydrology, Water supply, Potentiometric level.

Identifiers: Cook County(III), Du Page County(III), Kane County(III), Will County(III), McHenry County(III), Grundy County(III), *Chicago region(III).

Pumpage from deep wells in the Chicago region in-creased from 200,000 gallons per day (gpd) in 1864 to 150.7 million gallons per day (mgd) in 1971. As a result, artesian pressure in the Cambrian-ordovi-cian aquifer in Chicago has declined more than 850 feet. Pumpage from deep wells in the Chicago region is concentrated in northwestern and western Cook County, eastern Du Page and eastern Kane Counties, and around Joliet in Will County. Heavy Counties, and around Joliet in Will County. Heavy pumpage from deep wells outside the Chicago region occurs at Rockford, Belvidere, De Kalb-Sycamore, Rochelle, and Ottawa-Peru. From October 1971 through November 1975, pumpage from deep wells in the Chicago region increased to 165.7 mgd, an increase of 15.0 mgd or 10% more than the 1971 pumpage. For the Chicago region, average annual water-level declines during the 4year period ranged from 6 feet in McHenry County to 16 feet in Grundy County and averaged about 12 feet. Water levels in 6 selected observation wells outside the Chicago region declined an average of 1.7 feet per year during the same period. Withdrawals since 1971 within the Chicago region exceeded the practical sustained yield of the Cambrian-Ordovician aquifer, as they have each year since 1958, with the result that groundwater users continue to mine water. By the end of 1975, more than half of the upper units of the aquifer already had been dewatered in many areas. If the distribution of pumpage remains the same and pumpage continues to increase as indicated by recent trends, the principal water-yeilding units of the aquifer will be partially dewatered in many areas much sooner than previously anticipated. Only a few pumping levels exceeded 1000 feet in 1971. In 1975, at least 17 municipal and industrial wells had pumps set at 1000 feet or deeper. Water levels for 664 wells were tabulated in an appendix. (See also W73-10993 and W75-04727) (See also W73 (Humphreys-ISWS) W77-08302

AQUIFER MODELING HELPS FARMERS. Water Research in Action, Vol. 1, No. 12, p 1-2, April, 1977.

Descriptors: "Mathematical models, "Computer models, "Aquifers, Planning, Irrigation water, Model studies. Identifiers: "Snake River Plain Aquifer(Idaho).

A team of University of Idaho researchers and students are in the process of refining a computerized mathematical model of the Snake River Plain Aquifer, one of the most economically important water resources in Idaho. It is estimated that 4.5 million acre-feet of water flow through the 9,000 square mile aquifer each year. Among the values plugged into the model formulas are net amount of water applied by irrigation, the quantity of water used by vegetation, and precipitation/evaporation/snowmelt in the recharge areas. The net effect is a very usable predicting device that provides key information at selected points and indicates where more data needs to be collected. The model is now being used by Idaho Department of Water officials for water resource projections and planning studies. (Eberle-NWWA)

Field 2-WATER CYCLE

Group 2F-Groundwater

GROUND WATER RECHARGE IN EASTERN CONNECTICUT BASED ON SIMULATION MODELING,

Connecticut Univ., Storrs. R. E. Cady.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 045, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 67 p, 9 tab, 19 fig, 2 append, 30 ref. OWRT A-052-CONN(10).

Descriptors: *Groundwater recharge, *Flow system, *Hydraulic models, *Hydraulic conduc-tivity, *Hydraulic gradient, *Hydrogeology, Till, Glacial sediments, Streamflow, Permeability, *Connecticut, Bedrock, Simulation analysis. Identifiers: *Fractured bedrock.

The flow system within fractured bedrock and till of Eastern Connecticut is approximated by a numerical simulation model of small ground water basins. Ground water recharge is calculated as that amount of water necessary to maintain the flow system since recharge is the only input to a natural undeveloped ground water basin. The model is based upon a steady-state solution to ground water flow equations for a series of representative cross sections through each basin. Hydraulic conductivities are adjusted to correlate the model with existing stream flow data. Resultant values for recharge and hydraulic conductivity are well within one order of magnitude of values determined through independent techniques (maximum discrepancy of 19 percent). Regional hydraulic gradient and localized flow systems exhibit a substantial contribution to control of amounts of ground water recharge beyond the limits imposed merely by gla-cially deposited overburden. (de Lara-Conn) W77-08344

GROUNDWATER RESOURCES OF GUAM: OC-CURRENCE AND DEVELOPMENT,

Guam Univ., Agana. Water Resources Research Center

For primary bibliographic entry see Field 4B. W77-08448

THE EUTAW-MCSHAN AQUIFER IN MISSIS-

Geological Survey, Jackson, Miss. Water Resources Div. For primary bibliographic entry see Field 7C.

W77_08466

HISTORIC WATER-LEVEL CHANGES AND PUMPAGE FROM THE PRINCIPAL AQUIFERS OF THE MEMPHIS AREA. TENNESSEE: 1886-

Geological Survey, Memphis, Tenn. Water Resources Div. For primary bibliographic entry see Field 4B.

W77-08469

MAPS SHOWING GROUND-WATER CONDI-TIONS IN THE PUERCO-ZUNI AREA, APACHE AND NAVAJO COUNTIES, ARIZONA--1975, Geological Survey, Flagstaff, Ariz. Water Resources Div. For primary bibliographic entry see Field 7C. W77-08471

DIGITAL-COMPUTER MODEL OF THE SAND-STONE AQUIFER IN SOUTHEASTERN WISCONSIN, Geological Survey, Madison, Wis. Water

Resources Div.

H. L. Young. Southeastern Wisconsin Regional Planning Commission, Waukesha, Technical Report No 16, April 1976. 42 p, 11 fig, 20 maps, 2 tab, 3 append. \$5.00. Descriptors: *Model studies, *Drawdown, *Artesian aquifers, *Wisconsin, *Illinois, Digital Artesian aquiters, "Wisconsin, "Ilmoss, Digital computers, Computer programs, Aquifer characteristics, Sandstones, Analytical techniques, Projections, Withdrawal, Pumping, Water supply, Hydrogeology.

Identifiers: Southeastern Wisconsin, Northeastern

The sandstone aquifer in southeastern Wisconsin and northeastern Illinois is modeled as being a confined aquifer underlain by an impermeable bed (Precambrian basement rock) and overlain by a leaky confining bed (Maquoketa Shale). The model is a digital-computer program that computes changes in head caused by pumping from the aquifer. The program solves finite-difference equations that approximate the partial-differential equation of two-dimensional, nonsteady groundwater flow. Basic input to the program consists of the hydrologic properties of the aquifer and pump age from the aquifer. The model was calibrated by operating the program several times for the period 1880-1973, adjusting values of hydrologic properties until the computed drawdown approximated the known drawdown for that period. Using the calibrated model and estimated pumpage to 2000, drawdowns were predicted from 1974 through 1980, 1990, and 2000. Maximum drawdown is centered on New Berlin and is more than 300 feet from 1974 through 1990 and 450 feet from 1974 through 2000. (Woodard-USGS)

DIGITAL-MODEL ANALYSIS OF THE EF-FECTS OF WATER-USE ALTERNATIVES ON SPRING DISCHARGES, GOODING AND JEROME COUNTIES, IDAHO, Idaho. Water

Geological Survey, Boise, Resources Div. For primary bibliographic entry see Field 4B. W77-08484

2G. Water In Soils

W77-08102

FULVIC ACID-METAL ION INTERACTIONS IN

New Hampshire Univ., Durham. Dept. of Chemis-For primary bibliographic entry see Field 5A.

DELINEATION OF DECIDUOUS WETLAND FORESTS IN NORTHEASTERN CONNEC-TICUT.

Connecticut Univ., Storrs. Inst. of Water P. H. Anderson

Available from the National Technical Informa Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267 662, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1977. 123 p, 19 fig, 15 tab, 7 append, 86 ref. OWRT A-058-CONN(1), 14-31-0001-4007.

Descriptors: *Wetlands, *Freshwater, Boundaries, "Soil types, "Soil water, "Remote sensing, "On-site investigations, Plant populations, Topography, "Connecticut, "Forests. Identifiers: "Inland wetland identification,

Identifiers: "Inland wetland identification, "Delineation methodology, "False color infrared imagery, "Biological-physical gradients, "Wetland-upland transition, Zones, Deciduous wetland forests, Index of abundance, Ground truth, Soil pH, Crown cover.

Inland wetlands in Connecticut, presently defined by soil type, are delineated according to the National Cooperative Soils Survey of the U.S.D.A. Soil Conservation Service, a method which can produce many discrepancies in the location of inproduce many discrepancies in the location of in-land wetland boundaries. This study examining al-ternate delineation methods, was designed to (1) investigate vegetation distribution and selected

physical and chemical properties of wetland soils and bordering uplands and the interface between the two, and (2) provide the ground truth necessary for the identification and delineation of deciduous wetland forests using false color infrared (FCIR) imagery. In study sites located within the Town of Mansfield, Connecticut, line transects were laid out across wetland to upland transition zones, with plant species and layers identified, their positions recorded, and crown cover deter-mined. Discriminant analysis applied to abundance data showed which members of plant species best separate wetlands from uplands and which were representative of natural plant associations. Results from the soil studies reveal that the wetland soil to upland soil gradient changes significantly in soil pH and in soil water content. Soil water and topographic position govern plant distribution along these gradients, accounting for the distinct separation of wetland and upland plant associations. Of the criteria studied, vegetation distribution and crown cover, soil water content, and relief are the most useful for delineating deciduous wetland forests and are valuable in using remote sensing imagery. (de Lara-Connecticut) W77-08194

SPRAY IRRIGATION OF TREATED MUNICIPAL SEWAGE EFFLUENT AND ITS EF-FECT ON CHEMICAL PROPERTIES

FOREST SOIL,
Pennsylvania State Univ., University Park. Inst.
for Research on Land and Water Resources. For primary bibliographic entry see Field 5D. W77-08202

INFILTRATION CHARAC-RAINFALL. TERISTICS FOR A SEMI-ARID WATERSHED

Arizona Water Resources Research Center, Tucson.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 723, tion service, springited, vA 22101 as r5-207/25, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1976. 77 p, 10 fig, 4 tab, 41 ref. OWRT A-027-ARIZ(1), 14-31-0001-3503.

*Infiltration, *Gamma Descriptors: *Compaction, *Rainfall simulators, Soil compa tion, Arid lands, *Arizona, Model studies, Simula-tion analysis, Mathematical models.

Identifiers: Watershed soils, *Rainfall infiltration, Semi-arid soils.

Rainfall infiltration characteristics for a semi-arid watershed soil were studied. The soil examined was obtained from Page Ranch, 25 miles north of Tucson, AZ. Laboratory infiltration tests were conducted on reconstructed soil profiles similar to those on the watershed. A mathematical model of infiltration, developed by Dr. Roger Smith, was used to simulate the infiltration process. Results from infiltration tests conducted on site at the watershed during a previous research study were also simulated using the infiltration model. Laboratory and field infiltration tests were conducted using a realistic rotating disk rainfall simu-lator. Single- and dual-source gamma ray attenua-tion techniques were used to obtain soil moisture measurements within the laboratory soil profiles. Direct measurement of surface crusting effects in the laboratory using the dual-source technique was attempted but was determined to be unworkable due to resolution and boundary effect problems. Using the measured saturated hydraulic conductivity values of the laboratory and field soils, and the unsaturated soil properties as measured for the field soil, the mathematical model of infiltration as developed by Roger Smith simulated the infiltration rates of bare test plots. By changing the saturated conductivity of the upper soil layer, it was also possible to simulate the infiltration process on a grass-covered field plot. W77-08206

Lakes-Group 2H

ROOT GROWTH, STRENGTH, AND CHEMI-CAL PROPERTIES OF A HOBSON FRAGIPAN, Missouri Univ., Columbia. Dept. of Agronomy. C. R. Edmonds.

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satuwas ss on C. N. Edmonds. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267 908, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis, May 1976. 132 p. 23 fig. 16 tab, 86 ref, append. OWRT A-087-MO(2), 14-34-0001-6026.

Descriptors: Effluents, "Hydraulic conductivity, "Root growth, Soil strength, "Soil water movement, Waste water disposal, "Soil profiles, Soil properties, "Acidity, Acidic soils, "Missouri, "Soil horizons, "Soil chemical properties, Ion exchange, Soil-water-plant relationships.
Identifiers: "Fragipan horizon(Soils).

A large percentage of Ozark soils in Missouri pos-sess a fragipan horizon. The fragipan restricts water movement and root growth in the profile. This study was conducted to evaluate the effect of changes in acidity and bulk density on the Hobson fragipan with respect to root growth and hydraulic conductivity. Chemical and physical tests associated with basic soil properties were determined. Ion exchange relationships of six ion pairs, along with ion products of Fe, Al, and Mn hydroxides were examined. Hydraulic conductivity, probe penetration, and root growth experiments were conducted on reformed and natural samples of B2 and fragipan horizons. The rate of probe penetration had no effect on point resistance in reformed cores. Both acidity and high bulk density restrict root growth in the Hobson B2 and fragipan horizons. Data suggest low pH could induce Al toxicity in unlimed samples of both the B2 and fragipan soil. In reformed cores root growth was changes in acidity and bulk density on the Hobson fragipan soil. In reformed cores root growth was restricted at strengths between 10 and 20 bars, and greater strengths effectively stopped root growth. Strength of undisturbed B2 and fraigpan cores was 20 to 25 bars and greater than 100 bars, respectively, at 0.33 bar moisture tension. No roots 19, at 0.33 par mousture tension. No roots penetrated either core. The hydraulic conductivity of reformed cores was only slightly increased due to calcium oxide addition. Indications are the fragipan would remain stable with respect to roots and water movement unless it was physically modified. Profile modification would need to be suplemented with lime to effectively increase root distribution in the Hobson profile. (Blanchar-Missouri) W77-08285

A QUANTITATIVE STUDY OF ORGANIC CAR-BON DECOMPOSITION AND NITROGEN TRANSFORMATIONS IN SEWAGE SLUDGE-

SOIL SYSTEMS, Rutger - The State Univ., New Brunswick, N. J. Dept. of Soils and Crops. For primary bibliographic entry see Field 5B. W77-08291

A WATER MANAGEMENT MODEL FOR HIGH

WATER MANAGEMENT MODEL FOR HIGH WATER TABLE SOILS, North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering. For primary bibliographic entry see Field 3F. W77-08301

A SIMULATION OF AN IRRIGATION SCHEDULING MODEL WHICH INCORPORATES RAINFALL PREDICTIONS, Auburn Univ., Ala. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-08343

LANDSAT-1 DATA, ITS USE IN A SOIL SUR-

VEY PROGRAM,
South Dakota State Univ., Brookings. Dept. of
Plant Science; and South Dakota State Univ.,
Brookings. Remote Sensing Inst.
F. C. Westin, and C. J. Frazee.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 67-95, September 1975. 16 fig. 2 tab, 6 ref. NASA 5-21774, NASA 42-003-007.

Descriptors: *Soil surveys, *South Dakota, *Mapping. *Remote sensing, Soils, Maps, Surveys, Soil relief, Soil texture, Land use, Data processing, Satellites(Artificial), Analysis, Analytical techniques, Synoptic analysis, Distribution patterns, Soil types.

Identifiers: LANDSAT, Thematic soil maps.

The three objectives for this study were: (1) to investigate the unique characteristics of LANDSAT imagery as they aid in recognizing soil survey boundaries; (2) to explore the use of LANDSAT boundaries; (2) to explore the use of LANDSAT imagery for low intensity soil surveys; and (3) to investigate LANDSAT imagery as a base map for publishing thematic soil maps. Using many of the characteristics of LANDSAT imagery, a low intensity soil survey of Pennington County, South Dakota, was completed in 1974. LANDSAT-1 Dakota, was completed in 1974. LANDSAT-color composite transparencies, single band trans-parencies, and enlargement prints were in-terpreted to produce a soilscape map for 400,000 hectares. Areas of similar photographic charac-teristics were delineated on mylar over a color composite using a light table and a three-power magnifying glass. The field checking was done by a resource team of soil, geology, and range science specialists. The color composite transparency was adequate for locating most of the boundaries between soilscape areas. The soilscape map was interpreted to give general guidelines for land evaluation. It was concluded that a LANDSAT photographic background for soil-related informa-tion greatly enhances its use since much can be deduced about hydrology and land use. (See also W77-08408) (Humphreys-ISWS)

DELINEATION OF THE BOUNDARIES OF A BURIED PRE-GLACIAL VALLEY WITH LAND-

SAT-1 DATA, Purdue Univ., Lafayette, Ind. J. B. Peterson, F. E. Goodrick, and W. N.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 97-103, September 1975. 4 fig, 6 ref. NASA NAS 9-14016, NASA NGL 15-005-186.

Descriptors: *Soil surveys, *Indiana, *Remote sensing, *Glaciation, Pleistocene epoch, Soil classification, Land use, Soil types, Prairie soils, Glacial drift, Aquifers, Geomorphology, Satellites(Artificial). Identifiers: LANDSAT, Udoll soils, Udalfs,

Timber soils.

The continuity of a narrow meandering strip of Udoll (prairie) soils running east and west for approximately 40 miles across north central Indiana in an area predominantly of Udalfs (timber soils) was apparent in LANDSAT-1 (ERTS-1) data. The dark Udoll soils ocur in predominantly flat topogdark Udoll soils ocur in predominantly flat topography, contrasting sharply in satellite imagery from surrounding light colored Udalf soils in the characteristically rolling, undeveloped landscape of the late Wisconsin till plains. This dark stretch of prairie soil is believed to have formed in the heavy textured, poorly drained glacial debris which filled a major pre-glacial tributary of the Teays River system. This valley was apparently re-occupied and partly re-excavated by surface drainage during interglalcial times, following retreat of the Kansan and Illinoisan age ice invasions. Final filling of the valley occurred during sions. Final filling of the valley occurred during retreat of the East White sublobe of the Wisconsin stage ice. The origin and the continuity of this

meandering stretch of prairie was not recognized by soil scientists who, over a 60 year period, mapped the three counties which encompass it. Furthermore, geologists who had been searching for the exact location of this buried valley had been unsuccessful until the LANDSAT data provided an adequate synoptic view. Ready identification and location of the valley has significance to soil survey and land classifiction people as a guide to soil classification and land use and to geologists as a guide to location of a potentially economically significant aquifer. (See also W77-08408) (Humphreys-ISWS)

DRAINABLE POROSITY EVALUATION AND ITS RELATIONSHIP TO HYDRAULIC CONDUCTIVITY AND EXCHANGEABLE CATIONS UNDER DIFFERENT BULK DENSITIES, Alexandria Univ. (Egypt). Dept. of Soil and Water

For primary bibliographic entry see Field 4A. W77-08461

CHEMICAL AND VEGETATIVE STABILIZA-TION OF SOILS,

Bureau of Reclamation, Denver, Colo. Engineer-ing and Research Center. For primary bibliographic entry see Field 8D. W77-08512

PERSISTENCE OF MYCOBACTERIUM BOVIS BCG IN SOIL AND ON VEGETABLES SPRAY-IRRIGATED WITH SEWAGE EFFLUENT AND SLUDGE, Public Health Service, Cincinnati, Ohio. Div. of

Microbiology.
For primary bibliographic entry see Field 5C.
W77-08525

2H. Lakes

THE UTILITY OF PALEOLIMNOLOGICAL ANALYSES OF LAKE SEDIMENTS FOR EVALUATING ACID PRECIPITATION EFFECTS ON DILUTE LAKES, Cornell Univ., Ithaca, N.Y. Dept. of Natural

For primary bibliographic entry see Field 5A. W77-08103

TRANSIENT THREE-DIMENSIONAL CIRCU-LATION OF LAKES, Geological Survey, Menlo Park, Calif. Water

Resources Div.

Resources Jv. R. T. Cheng. ASCE Proc, Journal of the Engineering Mechanics Division, Vol 103, No EM1, Paper 12721, p 17-34, February 1977. 8 fig, 25 ref.

Descriptors: *Water circulation, *Lakes, *Model studies, "Numerical analysis, Analytical techniques, Finite element analysis, Mathematical models, Reservoirs, Turbulent flow, Gravity waves, Mixing.

A mixed analytical and numerical model to study A mixed analytical and numerical model to study the wind-driven, transient, three-dimensional circulation in lakes is presented. Emphasis is placed on the formulation and development of the model, which consists of a formal analytical solution together with a system of depth-averaged conservation equations. After solving the depth-averaged system numerically by the finite element technique, the three-dimensional velocity profiles are calculted from the formal solution. Simulation of an idealized lake shows good agreement on the of an idealized lake shows good agreement on the general circulation pattern and wave characteristics with the work of others. The limitation of this model is examined, and a solution is proposed to accommodate it. (Woodard-USGS) W77-08181

Field 2-WATER CYCLE

Group 2H-Lakes

A STATISTICAL ANALYSIS OF THE MERCURY CONCENTRATIONS IN FISH FROM LAKE JOCASSEE, SOUTH CAROLINA, Clemson Univ., S.C. Dept. of Environmental

Systems Engineering.
For primary bibliographic entry see Field 5A.
W77-08190

ARSENIC IN WATER AND FISH FROM LAKES HARTWELL, KEOWEE, AND JOCASSEE, SOUTH CAROLINA, Clemson Univ., S.C. Dept. of Environmental Systems Engineering.

For primary bibliographic entry see Field 5A. W77-08191

A SURVEY OF CADMIUM OCCURRENCE AND CONCENTRATION IN FISH FROM ELEVEN MAJOR RESERVOIRS IN SOUTH CAROLINA, Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5A. W77-08192

DELINEATION OF DECIDUOUS WETLAND FORESTS IN NORTHEASTERN CONNEC-

Connecticut Univ., Storrs. Inst. of Water Resources. For primary bibliographic entry see Field 2G. W77-08194

PLUVIAL LAKES OF NEVADA AND ESTI-MATED FULL PLUVIAL CLIMATES, Nevada Univ. System, Reno. Water Resources

M. D. Mifflin, and M. Wheat.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 721, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Center, Completion Report, May 1977. 77 p, 5 fig. 9 tab, 67 ref, 1 plate. OWRT A-007-NEV(2). A-021-NEV(1). 14-01-0001-798 and 1206.

Rain, *Lake Paleoclimatology, Lake *Climates, *Nevada, Descriptors: Rain, *Lake shores, *Paleohydrology, Paleoclimatology, Lake morphology, Lake beds, *Climates, *Nevada, Great Basin, Lakes, Evaporation, Lake basins. Identifiers: *Lake Lahontan(Nev), *Pluvial climates, *Pluvial lakes, Lake evaporation.

Study for shoreline evidence in more than 81 basins of Nevada has yielded recognition of 53 probable shoreline evidence of three pre-Lahontan Lakes in three basins, and absence of shoreline features in many basins previously thought to have contained pluvial lakes. Basin areas, basin floor al-titudes, lake areas, lake altitudes, over-flow relatitudes, lake areas, lake altitudes, over-flow rela-tions and other data have been developed to aid in quantitative analysis of full pluvial climates of Lahontan age in Nevada. Using modern aspects of Great Basin climates and associates hydrology, the observed pluvial lake paleohydrology could have been maintained by mean annual tempera-tures approximately 5 deg F lower than modern mean annual temperatures. Corresponding pluvial mean annual temperatures, corresponding pluvial mean annual precipitation averaging 68 percent over modern precipitation, and mean annual pluvial lake evaporation averaging 10 percent less than mean annual modern lake evaporation. The analyses indicate modern climates of the coolest and moistest parts of Nevada (extreme northwest Nevada and some parts of northeastern Nevada) were likely similar to the full pluvial climates in parts of southcentral Nevada and northwestern Nevada. (Fallon-Nevada) W77-08199

RELATIVE REFLECTANCE AND COMPLEX REFRACTIVE INDEX IN THE INFRARED FOR SALINE ENVIRONMENTAL WATERS, Missouri Univ.-Kansas City. Dept. of Physics.

For primary bibliographic entry see Field 2L.

MINERAL CYCLING IN RESERVOIRS, Oklahoma State Univ., Stillwater. Dept. of Zoolo-

For primary bibliographic entry see Field 5C. W77-08217

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; THE WIND-DRIVEN CURRENTS AND CONTAMI-NANT DISPERSION IN THE NEAR-SHORE OF LARGE LAKES

Case Western Reserve Univ., Cleveland, Ohio, Dept. of Earth Sciences For primary bibliographic entry see Field 5B.

W77-08220

A PREDICTIVE MODEL FOR TRANSIENT TEMPERATURE DISTRIBUTIONS IN UN-

Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics. For primary bibliographic entry see Field 5B. W77-08221

PUMPED-STORAGE IN THE PACIFIC NORTHWEST, AN INVENTORY.

Corps of Engineers, Portland, Oreg. North Pacific Div.

Report 26, January 1976. 151 p, 30 fig, 8 tab, 1 append.

Descriptors: *Pumped storage, *Pacific Northwest US, *Hydroelectric power, Powerplants, Lakes, Reservoirs, Peak power, Electric power production, Underground powerplants, Economics, Reservoir operation, Reservoir sites, Electric power demand.

Identifiers: *Pumped storage inventories, Weekly cycle pumped storage sites.

This report was prepared in response to a 1975 Congressional request that the Corps of Engineers compile an inventory of the potential pumped-storage projects in the Pacific Northwest and to identify those sites which have the most potential for inclusion in the basin development plan. The inventory covered the entire States of Oregon, Washington, and Idaho, and those portions of western Montana, Wyoming, Utah, and Nevada falling within the Columbia River Basin. The report consisted of a discussion of criteria used in selecting and evaluating sites, a listing of potential sites, together with preliminary estimates of plant size, reservoir characteristics, annual costs, and an evaluation of some of the more promising sites. Both daily/weekly and seasonal pumped-storage sites were included in the inventory. (Sims-ISWS)

NITROGEN AND PHOSPHORUS ANALYSES OF RAINFALL AT ROTORUA, NEW ZEA-

LAND, Marine Dept., Rotorua (New Zealand). Fisheries Research Div For primary bibliographic entry see Field 5A. W77-08242

FALLOUT OF NITROGEN PHOSPHORUS COMPOUNDS FROM THE AT-MOSPHERE AT NGAPUNA, NEAR ROTORUA, NEW ZEALAND,

Marine Dept., Rotorua (New Zealand). Fisheries

Research Div.
For primary bibliographic entry see Field 5A.
W77-08243

THE ACCUMULATION AND DISTRIBUTION OF ORGANOCHLORINES AND SOME HEAVY METALS IN AMERICAN FALLS RESERVOIR FISHES, WATER AND SEDIMENT, Idaho State Univ., Pocatello. Dept. of Zoology. For primary bibliographic entry see Field 5B.

BENTHIC MICROBIAL COMMUNITY RESPIRATION OF A SOFT-WATER LAKE, Connecticut Univ., Storrs. Inst. of Water Resources.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 917, Price codes: A05 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1977. 90 p, 19 fig, 4 tab, 73 ref. OWRT A-054-CONN(3), 14-31-0001-4007.

Descriptors: *Lake sediments, *Sediment-water interfaces, *Microbial degradation, *Chemical oxygen demand, *Oxygen, *Productivity, *Water analysis, *Aerobic bacteria, *Anaerobic bacteria, analysis, "Aeroole bacteria, "Anaeroole bacteria, Temperature, Light intensity, Connecticut. Identifiers: "Benthic microbial community respiration, "Soft-water bog lake, "Gas exchange, "Dissolved organic carbon, "Alternate terminal electron acceptors, *Dehydrogenase activity, Optical density, Dunham Pond(Conn).

Over a three year period, microbial community respiration of the sediment-water interface and the upper 9 cm of the surface sediments of Dunham Pond, a small (4.7 ha surface area), shallow (maximum depth 4.5 m), stratifying, soft-water bog lake in eastern Connecticut, was estimated. Relative rates of gas exchange were estimated and seasonal changes in dissolved organic carbon and optical density were analyzed for the overlying water, while light intensity and temperature were measured at the sediment surface. These variables indicate that the concentration of oxygen in the overlying water is the single most important factor influencing rates of gas exchange at the sedimentwater interface. Community respiration of the sur-face sediments was estimated by two independent means: The accumulation of chemical oxygen demand and the relative rates of electron transport as measured by dehydrogenase activity. Respiration was found to decrease with increasing sediment depth. Colony forming units of aerobic and anaerobic bacteria in the sediment horizons were estimated over several annual cycles. Sediments data indicate that respiration within the sediment column is limited by the availability of alternate terminal electron acceptors. The results of experiments with intact cores and sediment horizons indicate that Dunham Pond is a relatively productive lake, with the majority of productivity based on the benthic microbial community. W77-08296

CHARACTERISTICS OF THE BIOTIC CYCLE OF LAKE BAIKAL, (IN RUSSIAN), Limnologicheskii Institut, Irkutsk (USSR). K. K. Votintsev, and G. I. Popovskaya. Dokl Akad Nauk SSSR Ser Biol. 216(3), p 666-669,

Descriptors: Lakes, *Primary productivity, *Food chains, *Nitrogen, *Phosphorus, Energy, Water pollution, Nutrients. Identifiers: *Lake Baikal(USSR), *Biotic cycle.

The size and depth of Lake Baikal (USSR), the high primary production/1 m2 of surface area (127 g organic C/yr on the average), the antiquity of the lake and the stability of the environment, the balance of inorganic and organic N and P com-pounds and the creation of highly specialized ecological groups which provide a high percentage of energy utilization in the food chain were studied.--Copyright 1975, Biological Abstracts, Inc. W77-08321

THE PRODUCTIVITY OF FOULING ORGAN-ISM ASSOCIATIONS IN LAKE ZELENET-SKOE, (IN RUSSIAN), Akademiya Nauk SSSR, Leningrad. SNUE, (IN RUSSIAN), Akademiya Nauk SSSR, Lenin Zoologicheskii Institut. For primary bibliographic entry see Field 5C. W77-08323

LAKE NAIVASHA AND LAKE NAKURU: AN ECOLOGICAL COMPARISON BETWEEN TWO BIRD LAKES IN EAST AFRICA, (IN SWEDISH), Uppsala Univ. (Swedish), oz Zoology.

A. Lundberg, and B. Tallmark. Fauna Flora (Stockh). 68(1), p 1-15, 1973.

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Descriptors: *Africa, *Lakes, *Ecology, Vegeta-tion, *Aquatic algae, Invertebrates, *Birds, Water pollution, *Aquatic plants. Identifiers: *Lake Naivasha(East Africa), *Lake Nakuru(East Africa), Alkaline lakes.

The Rift Valley lakes are of great biological interest because of their extremely rich bird fauna. Lake Naivasha is a fresh-water lake; Lake Nakuru is alkaline. Due to this, there is a great difference of vegetation. The water vegetation of Lake Naivasha is highly developed, e.g., sedge, papyrus, water-ilies and submersed species, while plankton is of less importance. The algae of Lake Nakuru form almost the whole vegetation. The number of invertebrate species is also much number of invertebrate species is also much greater in Lake Naivasha than in Lake Nakuru. The bird fauna is more differentiated in the fresh-The bird fauna is more differentiated in the fresh-water lake, but because of the enormous supply of food avaiable for primary consumers of birds, the number of the latter is greater in the alkaline lake. Due to the position of the lakes in a relatively den-sely populated district and the lack of outfall of Lake Nakuru, the risk of pollution is great. In-vestigations have indicated very low toxic propor-tions in animals. The rapid increase of (human) population in Africa may quickly change the situa-tion for the worse.—Copyright 1975, Biological Ab-stracts. Inc. stracts, Inc. W77-08324

LAMINATED SEDIMENTS IN HOLOMICTIC

BERKSHIRE LAKES,
Massachusetts Univ., Amherst. Dept. of Zoology.
For primary bibliographic entry see Field 2J.

HYPOPHTHALMICHTHYS MOLITRIX (VAL.)) FOR INCREASING FISH PRODUCTIVITY AND DECREASING THE LEVEL OF EUTROPHICA-TION OF DNIEPER RESERVOIRS, (IN RUS-SIAN),

Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.

For primary bibliographic entry see Field 5C. W77-08364

THE LANDSAT-1 MULTISPECTRAL SCANNER AS A TOOL IN THE CLASSIFICATION OF IN-

LAND LAKES,
National Eutrophication Survey, Corvallis, Oreg.
For primary bibliographic entry see Field 5A.
W77-08433

TROPHIC STATUS OF INLAND LAKES FROM

Wisconsin Univ., Madison. Inst. for Environmental Studies. For primary bibliographic entry see Field 5A. W77-08434

THE USE OF LANDSAT-1 IMAGERY FOR WATER QUALITY STUDIES IN SOUTHERN SCANDINAVIA, Lund Univ., (Sweden). Dept. of Physical Geog-

For primary bibliographic entry see Field 5A. W77-08435

BEACH PROFILE CHANGES: EAST COAST OF LAKE MICHIGAN, 1970-72, Western Michigan Univ., Kalamazoo. For primary bibliographic entry see Field 2J. W77-08440

FOX CHAIN OF LAKES INVESTIGATION AND WATER QUALITY MANAGEMENT PLAN, Illinois State Water Survey, Urbana. V. Kothandaraman, R. L. Evans, N. G. Stall, and

D. L. Gross.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 125, Price codes: A10 in paper copy, A01 in microfiche. Cooperative Resources Report 5, Illinois State Water Survey, Illinois State Geological Survey, 1977. 200 p., 106 fig, 59 tab, 126 ref.

Descriptors: *Lakes, *Water quality, *On-site investigations, *On-site data collections, *Illinois, *Data collections, *Hydrologic data, Hydrologic aspects, Hydraulics, Water levels, Water temperature, Limnology, Sediments, Trace elements, Water balance, Water circulation, Nutrients, Eutrophication, Biological properties, Chemical properties, Physical experties Water mollution properties, Physical properties, Water pollution sources, Algae, Benthos, Glacial soils, Geology. Identifiers: *Fox Chain of Lakes(II).

The results of an extensive technical program conducted jointly by the Illinois State Water Survey and the Geological Survey on the Fox Chain of Lakes were presented. This effort was directed toward ascertaining the causes of lake eutrophication and the means by which the causes may be halted, reversed, or at least minimized. Geo-graphic, geologic, hydrological, physical, chemi-cal, and biological characteristics of the lakes were employed in identifying the causes of eutrophic conditions of the lakes. The trophic condition of the lakes was discusses as related to their limnological characteristics and nutrient budget. The nutrients responsible for the accelerated aging of the lakes were identified, and the sources of the nutrients and proportional contribution of each source were assessed. Only about 27% of the lakes drainage area as measured at Jognburg lie within Illinois. The Chain's water surface area is approximately 6850 acres, and the lakes have a mean depth of about 5.7 feet at the normal pool elevation 736.5 feet above msl. Artificial destratification and 736.3 feet above mst. Artificial destraint auton and the chemical controls proposed are designed to offer some immediate relief from the consequences of eutrophication. The ultimate success in reversing the eutrophic trends in the Fox Chain of Lakes will depend on the drastic reduction of the nutrient loading to the lake system both from without and within the lake area. (Humphreys-W77-08442

A STUDY OF COOLING INITIALLY UNIFORM AND THERMALLY STRATIFIED LAYERS OF WATER, Purdue Univ. Lafayette, Ind. School of Mechani-

cal Engineering.
For primary bibliographic entry see Field 5G.
W77-08444

POPULATION DYNAMICS AND SPECIES DIVERSITY OF ICHTHYO-PARASITOFAUNA OF THE BUFFALO NATIONAL RIVER, Arkansas Univ., Fayetteville. Dept. of Zoology. For primary bibliographic entry see Field 5C. W77-08446

SELECTIVE WITHDRAWAL AND HEATED WATER DISCHARGE: INFLUENCE ON THE WATER QUALITY OF LAKES AND RESERVOIRS PART I - SELECTIVE WITHDRAWAL, Wisconsin Univ. -Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5G.
W77-08447

REPRODUCTION RATE AND PRODUCTIVITY OF BACTERIA IN THE PONDS OF THE KARAMET-NIYAZ FISHERY FARM, (IN RUS-SIAN),
Akademiya Nauk URSR, Kiev. Instytut
Hidrobiologii. For primary bibliographic entry see Field 5C. W77-08462

COMPUTER PROGRAM FOR RESERVOIR-WATER BUDGETS, Agricultural Research Service, Chickasha Okla.

Southern Great Plains Watershed Research Center. For primary bibliographic entry see Field 4A. W77-08464

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1974-75 WATER Geological Survey, Austin, Tex. Water Resources

Div. For primary bibliographic entry see Field 5A.

W77-08483

A PREDICTIVE PHOSPHORUS MODEL FOR LAKES - SENSITIVITY ANALYSIS AND APPLI-CATIONS

North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C. W77-08499

THE LIMNOLOGY OF A NORTH CAROLINA MILLPOND WITH SPECIAL REFERENCE TO HISTORICAL CHANGES AS EVIDENCED BY SEDIMENT CORE ANALYSIS, North Carolina Univ. at Chapel Hill. Dept. of En-

vironmental Sciences and Engineering. For primary bibliographic entry see Field 5C. W77-08507

2I. Water In Plants

ROOT GROWTH, STRENGTH, AND CHEMI-CAL PROPERTIES OF A HOBSON FRAGIPAN, Missouri Univ., Columbia. Dept. of Agronomy. For primary bibliographic entry see Field 2G. W77-08285

27TH NORTHWEST FISH CULTURE CON-FERENCE. Conference held at Twin Falls, Idaho, December

Descriptors: Rainbow trout, Salmon, Sockeye salmon, *Fish hatcheries, Chinook salmon, Bass, *Columbia River, *Pacific Northwest U.S., Canada, *Aquiculture, *Fish, *Conferences. Identifiers: Columbia River Basin, *Snake River, Chambers Creek Basin, Dworshak National Fish Hatchery, Alberta, Dorion fish hatchery, *Fish culture.

Northwest Fish Culture Conferences are informal meetings for exchange of information and ideas concerning all areas of fish culture. Current concerning all areas of fish culture. Current progress reports of management practices and problems, new developments, and research studies are presented. The Proceedings contain unedited briefs or oral reports presented at the conference. Much of the material concerns progress of incompleted studies or projects. (Klontz-Idaho) w77.082100 W77-08309

THE USE OF SKYLAB DATA TO STUDY THE EARLY DETECTION OF INSECT INFESTA-

Field 2-WATER CYCLE

Group 21—Water in Plants

TIONS AND DENSITY AND DISTRIBUTION OF HOST PLANTS,
Agricultural Research Service, Weslaco, Tex.
Southern Region Citrus Insects Research.
For primary bibliographic entry see Field 7C. W77_08422

GROWTH OF TROPICAL AND TEMPERATE GRASSES AT PALMERSTON NORTH I. WARM-SEASON YIELDS WITH AND WITHOUT IRRIGATION, Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiolo-

For primary bibliographic entry see Field 3F. W77-08457

POTENTIAL OF NEW SUMMER GRASSES IN NORTHLAND: I. WARM-SEASON YIELDS UNDER DRYLAND AND IRRIGATION. Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiology Div. For primary bibliographic entry see Field 3F. W77-08458

THE INFLUENCES OF SIMULATED MOISTURE STRESS CONDITIONS AND OSMOTIC SUBSTRATES ON GERMINATION AND GROWTH OF CULTIVATED AND WILD

AND GROWTH OF COLORD SAFFLOWERS, Pahlavi Univ., Shiraz (Iran). Coll. of Agriculture. A. Bassiri, M. Khosh-Khui, and I. Rouhani. Journal of Agricultural Sciences, Vol. 88, No. 1, p. 95-100, February, 1977. 2 fig, 2 tab, 16 ref.

Descriptors: *Plant growth, *Moisture stress, *Moisture deficit, *Osmotic pressure, Germination, Droughts, Water supply, Salinity tolerance, Arid lands, Crop growth, Crop response, Moisture uptake, Stress, Moisture availability, Ecotypes. Identifiers: *Osmotic potential.

Comparisons were made between cultivated safflower varieties (Carthmus tinctorius L.) and six wild ecotypes (C. oxyacantha Bieb.) for their tolerance to simulated drought conditions. Experiments were made to compare different osmotic substances and the relative tolerance of wild ecotypes and cultivated varieties of safflower. These experiments may be valuable in finding the strain most resistant to drought. Plant characteristics of the wild strains were noted and soil samples from their collection sites were analyzed for the electri-cal conductivity of the saturated extract. Polyethylene glycol, mannitol, and sodium chloride were used as osmotic substrates. The influences of treatments were studied on seed ger-mination, shoot length, and fresh and dry weight of shoots and roots of seedlings. The results are of shoots and roots of seedlings. The results are presented. Increased osmotic potentials progressively delayed and reduced seed germination, shoot length and fresh and dry weights of seedlings. Shoots were, however, more adversely affected than roots. Wild ecotypes were apparently more sensitive to high osmotic potentials than the cultivated varieties. (Jamail-Arizona).

2J. Erosion and Sedimentation

THE UTILITY OF PALEOLIMNOLOGICAL ANALYSES OF LAKE SEDIMENTS FOR EVALUATING ACID PRECIPITATION EF-FECTS ON DILUTE LAKES,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources. For primary bibliographic entry see Field 5A. W77-08103

AMERICAN SEDIMENTATION LAW AND PHYSICAL PROCESSES,
For primary bibliographic entry see Field 6E.

W77-08130

SEDIMENT YIELD AND LAND USE IN SOUTHWEST UNITED STATES. Geological Survey, Lakewood, Colo. Water Resources Div. For primary bibliographic entry see Field 4D. W77-08178

DATA FOR CALIBRATING UNSTEADY-FLOW SEDIMENT-TRANSPORT MODELS, EAST FORK RIVER, WYOMING, 1975, Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08180

EFFECTS OF MEANDERING IN ALLUVIAL STREAMS, Battelle-Pacific Northwest Labs. Richland, Wash. For primary bibliographic entry see Field 2E.

ALTERNATIVE MEASURES OF RIVER CHAN-NEL SHAPE AND THEIR SIGNIFICANCE, Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography. For primary bibliographic entry see Field 8B. W77-08241

MICROBIAL BENTHIC MICROBIAL
RESPIRATION OF A SOFT-WATER LAKE,
Storre Inst. of Water COMMUNITY Connecticut Univ., Storrs. Inst. of Resources. For primary bibliographic entry see Field 2H. W77-08296

PYRO- AND TRIPOLY-PHOSPHATE CON-TENTS OF SEDIMENTS,
Missouri Univ.-Columbia. Dept. of Agronomy. For primary bibliographic entry see Field 5A. W77-08306

STATISTICAL CHARACTERIZATION DILUTE PARTICULATE SUSPENSIONS IN TURBULENT FLUID FIELDS, Illinois Univ. at Urbana-Champaign. Dept. of Nuclear Engineering. For primary bibliographic entry see Field 5B. W77-08330

LAMINATED SEDIMENTS IN HOLOMICTIC BERKSHIRE LAKES, Massachusetts Univ., Amherst. Dept. of Zoology.

S. D. Ludlum.

S. D. Eddum. Limnology and Oceanography, Vol. 21, September 1976, p. 743-746. 1 tab, 12 ref. OWRT A-077-MASS(1), 14-34-0001-7045.

*Massachusetts, Descriptors: Sedimentation. Sedimentation rates, Lakes, Lake beds, *Lake sediments, Limnology, Sampling, Profundal zone. Identifiers: *Berkshire Hills(Mass), *Laminated sediments, Sediment sampling techniques.

aminated sediments are common in the profundal sediments of the deeper holomictic lakes in the Berkshire Hills of Massachusetts. The laminae are best developed in lakes subject to prolonged seasonal hypolimnetic anoxia and in one lake are limited to water depths in which seasonal anoxia occurs. Samples were taken from the deepest area of all lakes using Ekman dredges, dried, sliced into vertical sections, scraped or cleaned, oven-dried and then examined for sediment laminae. (Lefferts-Massachusetts)

BEACH PROFILE CHANGES: EAST COAST OF BEACH PROFILE CHANGES: EAST COAST OF LAKE MICHIGAN, 1970-72. Western Michigan Univ., Kalamazoo. R. A. Davis, W. G. Fingleton, and P. C. Pritchett. Available from the National Technical Information Service, Springfield, VA 22161 as AD A018891, Price codes: A05 in paper copy, A01 in microfiche. Army Corps of Engineers, Coastal Engineering Research Center Miscellaneous Paper No. 10-75, October 1975. 97 p, 28 fig, 6 tab, 28 ref, 1 append. Army DACW72-70-C-0037.

Descriptors: *Beach erosion, *Shores, *Lake Descriptors: "Deach crosson, Shores, Lakes, Michigan, "Great Lakes, Surveys, Measurement, Lakes, Water levels, Coasts, Beaches, Erosion, Sedimentation, Sediments, Geomorphology, Identifiers: "Bluff erosion, "Beach profiles.

This field study of beach changes on the eastern shore of Lake Michigan concerned the movement of the bluff or the edge of the terrace marking the landward boundary of the beach. Data collected every 4 weeks from August 1970 to August 1972 ated recession or no change at each of 17 indicated recession or no change at each of 17 profile sites on a 250-mile segment of the east coast of Lake Michigan. During this period, lake levels were rising from a mean of 578.9 ft above mean water level (MWL) in 1970 to 579.7 ft MWL in 1972. The maximum bluff erosion at any one site between monthly surveys was 20 ft at profile 4 in June 1972. Variables affecting the rate of movement of the bluff include lake level, composition of the bluff or terrace orientation and straightness. of the bluff or terrace, orientation and straightness of shoreline, wave climate, manmade structures, and possibly longshore bars. There was a lack of correlation between bluff erosion at nearby stations, but each site varied seasonally, with max-imum erosion occurring in late fall when storm oc-currence is also high. Shore ice protected the beaches in winter; erosion resumed in spring at a reduced level. Beach width from the base of the bluff to the water level at the time of the survey also varied seasonally, with beaches narrow in early summer when lake level is at a maximum and wider in late fall when lake level is at a lower level. wider in late fail when lake level is at a lower level. The study beaches were mostly well-sorted sand (mean grain size between 0.330 to 0.189 mm or 1.60 and 2.40 phi units), with some gravel and heavy mineral concentrations.(Sims - ISWS) W77-08440

THE LIMNOLOGY OF A NORTH CAROLINA MILLPOND WITH SPECIAL REFERENCE TO HISTORICAL CHANGES AS EVIDENCED BY SEDIMENT CORE ANALYSIS, North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering. For primary bibliographic entry see Field 5C. W77-08507

2K. Chemical Processes

FULVIC ACID-METAL ION INTERACTIONS IN New Hampshire Univ., Durham. Dept. of Chemis-

For primary bibliographic entry see Field 5A. W77-08102

CONTINUOUS AUTOMATED MONITORING OF CHEMICAL AND PHYSICAL CHARACTERISTICS OF THE RED CEDAR RIVER, Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife. For primary bibliographic entry see Field 5A. W77-08110

U S GEOLOGICAL SURVEY, WATER RESOURCES DIVISION, RADIOCARBON MEA-SUREMENTS I, Geological Survey, Reston, Va. Water Resources

For primary bibliographic entry see Field 4B. W77-08169

Estuaries—Group 2L

INVESTIGATION OF DETECTION LIMITS FOR SOLUTES IN WATER MEASURED BY LASER RAMAN SPECTROMETRY, Smithsonian Institution, Washington, D.C.; and Geological Survey, Lakewood, Colo. Water

Resources Div.

K. M. Cunningham, M. C. Goldberg, and E. R.

Analytical Chemistry, Vol 49, No 1, p 70-75, January 1977. 3 fig, 2 tab, 23 ref.

Descriptors: *Water analysis, *Chemical analysis, *Spectroscopy, *Dissolved solids, Analytical techniques, Solutes, Ions, Remote sensing. Identifiers: *Laser raman spectrometry.

The influence of experimental parameters on detection sensitivity was determined for lasar Raman analysis of dissolved solutes in water. Individual solutions of nitrate, sulfate, carbonate, bicar-bonate, monohydrogen phosphate, dihydrogen phosphate, acetate ion, and acetic acid were mea-sured. An equation is derived which expresses the signal-to-noise ratio in terms of solute concentration, measurement time, spectral silt width, laser power fluctuations, and solvent background intensity. Laser beam intensity fluctuations at the sample and solvent background intensity are the most important limiting factors. (Woodard-USGS) W77-08171

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RELATIVE REFLECTANCE AND COMPLEX REFRACTIVE INDEX IN THE INFRARED FOR SALINE ENVIRONMENTAL WATERS, Missouri Univ.-Kansas City. Dept. of Physics. For primary bibliographic entry see Field 2L. W77-08215

IMPURITY CONCENTRATIONS IN SEA ICE, McGill Univ., Montreal (Quebec). Dept. of For primary bibliographic entry see Field 2C.

MEASUREMENT OF THE ATTENUATION OF ELECTROMAGNETIC RADIATION BY ELECTROMAGNETIC RADIATION BY WATER IN THE VISIBLE REGION OF THE SPECTRUM

Missouri Univ., Kansas City. Dept. of Physics. For primary bibliographic entry see Field 1A. W77-08293

GROUNDWATER RESOURCES OF GUAM: OC-CURRENCE AND DEVELOPMENT, Guam Univ., Agana. Water Resources Research

For primary bibliographic entry see Field 4B. W77-08448

SPECTROANALYTICAL PARAMETERS OF FUNGAL METABOLITES: OOSPOREIN AND DESMETHOXYVIRIDIOL,

Auburn Univ., Ala. Dept. of Chemistry.

Audum Only., Ala. Dept. of Chemistry.

R. J. Clarkson, Jr.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 245, Price codes: A04 in paper copy, A01 in microfiche Master of Science Thesis, December 11, 1974, 46 p, 17 fig, 23 ref. OWRT A-035-ALA(6).

Descriptors: Fungi, Metabolism, *Fluorescence, *Analytical techniques, *Spectroscopy, Chemical analysis, Pollutant identification, Molecular strucstays, Fountescence, Instrumentation. Identifiers: Spectroanalytical parameters, *Fungal metabolites, *Oosporein, *Desmethoxyviridiol, *Phosphorescence, Spectral anomalies.

The spectroanalytical parameters of oosporein were investigated, and the fluorescence spectra were reported, a possible explanation of anomalies which occurred in the course of the research, is discussed. Molecular weight studies were carried

out on oosporein in an effort to explain the spectral anomalies either in terms of decomposition of oosporein or in terms of dimerization. Also, some related research in terms of EPR data and visible spectra was performed. The spectroanalytical parameters of desmethoxyviridiol were investigated, and U.V., flurorescence, and Phosphorescence spectra were reported, as well as extinction coefficients and fluorescence and phosphorescence lifetimes. Some discussion was presented in terms of irregularities in the Beer's plot as well as in the dilution-fluorescence intensity plot, and a possible explanation was offered. Quenching experiments were performed in order to ascertain whether the low-temperature luminescence of desmethoxyviridiol was due to phosphorescence or delayed fluorescence. W77-08449

DISSOLVED SOLIDS, HARDNESS, AND ORTHOPHOSPHATE OF SURFACE-WATER RUNOFF IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT, Geological Survey, Tallahassee, Fla. Water Persenter Sir. Resources Div. For primary bibliographic entry see Field 7C. W77-08467

FRACTIONATION AND CONTROL OF IRON IN CHANNELIZED AND SWAMP DRAINAGE STREAMS IN NORTH CAROLINA, East Carolina Univ., Greenville, N.C. Dept. of Biology. For primary bibliographic entry see Field 5B. W77-08510

2L. Estuaries

RESOURCE POLICIES AUTHORITIES, COASTAL ZONE MANAGE-MENT PROGRAM IMPLEMENTATION, Corps of Engineers, Washington, D.C. For primary bibliographic entry see Field 6E. W77-08114

BOUNDARIES OF THE COASTAL ZONE: A SURVEY OF STATE LAWS, Louisiana State Univ., Baton Rouge. Sea Grant Legal Program. For primary bibliographic entry see Field 6E. W77-08132

OF MARINE PHYTOPLANKTON, (IN RUS-SIAN), All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
For primary bibliographic entry see Field 5C. W77-08160

EFFECT OF METALS ON PHOTOSYNTHESIS

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED
NEAR NEW ORLEANS, LOUISIANA (LAKE
PONTCHARTRAIN, LOUISIANA, AND VICINITY HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, La. Water
Partitions of the Control of the Control

Resources Div. For primary bibliographic entry see Field 8D.

COASTAL ZONE LEGISLATION: LOUISIANA LANDMARKS, LABYRINTHS LOGROLLING

Louisiana State Univ., Baton Rouge. Center for Wetland Resources. For primary bibliographic entry see Field 6E. W77-08186

DRIFT VELOCITIES OF SURFACE FILMS OVER WAVES,
Connecticut Univ., Storrs. Inst. of Water

Resources. For primary bibliographic entry see Field 5B.

METHODOLOGY FOR APPLYING THE FINITE

METHODOLOGY FOR APPLYING THE FINITE ELEMENT METHOD TO PARTIALLY STRATIFIED ESTUARIES, Clemson Univ., S.C. Dept. of Civil Engineering. J. E. McCoy, and B. L. Edge. Available from the National Technical Information Service, Springfield, VA 22161 as PB-267719, Price codes: A04 in paper copy, A01 in microfiche. Clemson University Water Resources Research Institute, Report No. 66, January, 1977. 45 p, 3 fig, 27 ref, 3 append. S-052-SC.

Descriptors: *Estuaries, *Mathematical models, *Stratification, Hydrodynamics, *Finite element analysis, Model studies, Equations, Methodology, *Stratified flow, Numerical analysis. Identifiers: Galerkin method.

A two-dimensional model which predicts con-stituent transport in stratified estuarine flow systems would enable planners and engineers to determine consequences of proposed modifica-tions to stratified bodies of water. This study attempts to ascertain whether the finite element method can be formulated for a stratified system and then determines a nonlinear numerical analy-sis based on the finite element approach for an estuarine system. A finite element model of two-dimensional constituent transport is developed and applied to stratified flow systems. The results indicate that the finite element method can be suc-cessfully developed to model stratified flow systems. The finite element method is applied to systems. Inc runte element method is applied to the equations of motion, continuity, constituent transport, and density variation with salinity. As-sumptions consistent with application to estuarine systems are defined. The parameters are approximated by a polynomial variation over each ele-ment in the system representation. The Galerkin method is used to determine the values of the parameters at element nodes, by solution of a system of simultaneous equations. With the nodal values of the parameters obtainable, a finite difference technique is used to extend the calculations through time. In addition to showing the ap-plicability of the finite element method to stratified flow systems, a formulation of the governing equations of estuarine flow is presented in al-gorithmic form according to the finite element solution technique. This formulation is a prerequisite to the construction of a computer algorithm to execute the numerous repetitive calculations and to subsequently model estuarine stratified flow successfully. W77-08198

RELATIVE REFLECTANCE AND COMPLEX REFRACTIVE INDEX IN THE INFRARED FOR SALINE ENVIRONMENTAL WATERS, Missouri Univ.-Kansas City. Dept. of Physics. M. R. Querry, W. E. Holland, R. C. Waring, L. M. Earls, and M. D. Querry. Journal of Geophysical Research, Vol. 82, No. 9, p 1425-1433, March 20, 1977. 8 fig, 3 tab, 14 ref. OWRT A-091-MO(2), USGS 14-08-0001-12636.

Descriptors: *Saline water, *Reflectance, *Refractivity, *Infrared radiation, *Great Salt Lake, *Pacific Ocean, *Atlantic Ocean, Optical Lake, Facine Ocean, Atlantic Ocean, Optical properties, Sea water, Aqueous solutions, Laboratory tests, Salinity, Salts, Lakes, Oceans, Phosphates, Mine water, Effluents, Remote sensing, Chemical analysis, Data processing, Analytical techniques. Identifiers: *Dead Sea(Israel), *San Francisco Bay(Calif).

By using distilled water as the standard reflector, relative specular reflectance spectra in the 2- to 20-

Field 2-WATER CYCLE

Group 2L—Estuaries

micrometer wavelength region of the infrared were measured for surface water samples col-lected from the San Francisco Bay, the Pacific Ocean, the Atlantic Ocean, the Great Salt Lake (Utah), the Dead Sea (Israel), and an effluent pit of a phosphate mine in central Florida. Phase difference spectra and spectral values of the complex refractive index were computed for each water sample by applying a Kramers-Kronig analysis to the relative reflectance spectra. Spectral values for the complex refractive index suitable for Mie scattering calculations were tabulated for each water sample. The reflectance spectra of the natural values of the complex refractive index spectra of the natural values. ral saline waters bore great similarity to spectra for individual aqueous solutions containing NACl, K2S04, NH4H2P04, NaNo3, and NaHC03. Chemical analyses of the water samples also were presented in tabular form. (Sims-ISWS) W77-08215

A PREDICTIVE MODEL FOR TRANSIENT TEMPERATURE DISTRIBUTIONS IN UN-

Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.

For primary bibliographic entry see Field 5B. W77-08221

EFFECTS OF 40-FOOT CHARLESTON HARBOR PROJECT ON TIDES, CURRENTS, AND SALINITIES, HYDRAULIC MODEL INVESTIGATION, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.

H. A. Benson. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD-A024 524, Price codes: A09 in paper copy, A01 in microfiche. Miscellaneous Paper H-76-9, May 1976. 188 p, 92 fig, 70 tab.

Descriptors: *Model studies, *Harbors, *Estuaries, *South Carolina, *Hydraulic models, Rivers, Tides, Currents(Water), *Salinity, Channels, Navigation, Flow, Saline water intrusion, Channel improvement, Shoals, Coastal engineering. Identifiers: *Charleston Harbor(SC).

The Charleston Harbor Model reproduced the Ashley, Cooper, and Wando Rivers and a portion of the Atlantic Ocean. The model was of fixed-bed construction and was equipped with all the neces sary appurtenances for accurate reproduction and measurement of tides, tidal cuurrents, salinity intrusion, and other significant phenomena of the trusion, and other significant phenomena of the prototype. The plan tested consisted of deepening the existing 35-ft-deep Cooper River navigation channel to 40 ft from the ocean to approximately river mile 20.6 and Shipyard Creek to 38 ft. In addition, the proposed Wando River Terminal channel was installed in the model at a depth of 35 ft. Hydraulic and salinity tests were made with the deepened project for two Pinopolis release conditions. The first condition involved the existing The first condition involved the existing weekly average freshwater discharge at the Pinopolis power generating station of 15,600 cfs. The second flow condition reproduced a weekly average flow at Pinopolis of 3500 cfs. The results of these tests were reported. (Sims-ISWS)

THERMAL SENSOR FOR MEASUREMENT OF OCEAN CURRENT DIRECTION.

W77-08222

Office of the Secretary (Navy), Washington, D.C.

G. A. Edgerton.
U.S. Patent No. 3,995,480, 4 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 66, December 7, 1976.

Descriptors: *Patents, *Currents(Water), *Ocean currents, Instrumentation, Measurement, Flow measurement, Water circulation, Turbulence, measurement, Velocity.

Identifiers: Current direction, Sensors, Thermal

The measurement of direction of ocean current using a thermal sensor can be accomplished by using simple convective heat transfer theory. If a body (cylinder or sphere) is immersed in a moving fluid a boundary layer develops from the leading edge, or rather the stagnation point. In this boundary layer, the fluid velocity increases from zero at the surface of the body to the value of the velocity of the inviscid flow around the body. The flow in the boundary layer in the vicinity of the stagnation point is always laminar, but transition stagnation point is always taminar, but transition to turbulent flow may occur at some point downstream of the stagnation point. The changes in both the laminar to turbulent flow and the velocity gradient around the body cause a temperature gradient around the body. This invention uses a sensor having a spherical configuration for the measurement of ocean currents. A hollow spherical housing made from material that has good heat transfer characteristics has its inside lined with a multitude of temperature sensing elements which are used to determine the two stagnation points on the sphere when immersed in a moving fluid. The stagnation points always align themselves with the direction of fluid flow. (Sinha-OFIS)

THE INFLUENCE OF BRACKISH-WATER IN-TRUSION ON MACROINVERTEBRATE AS-SOCIATIONS OF THE LOWER TCHEFUNCTE RIVER, LOUISIANA,

New Orleans Univ., La. Dept. of Biological Sciences. For primary bibliographic entry see Field 5B.

COASTAL ENERGY IMPACT PROGRAM. National Oceanic and Atmospheric Administrations, Washington, D.C. For primary bibliographic entry see Field 6E.

W77-08292

W77-08358

REPORT ON WATER RESOURCES PROBLEMS OF WESTERN COLLIER COUNTY, FLORIDA AS AFFECTED BY THE GAC CORPORATION'S CANAL SYSTEM IN ITS GOLDEN GATE DEVELOPMENT PROJECT,

Florida Univ., Gainesville. Coll. of Law. For primary bibliographic entry see Field 6E. W77-08380

A CONTROLLABLE AUTOMATED ENVIRON-MENTAL DATA ACQUISITION AND MONITORING SYSTEM,

Brookhaven National Lab., Upton, N. Y For primary bibliographic entry see Field 7C.

SUSPENDED-PARTICLE TRANSPORT CIRCULATION IN SAN FRANCISCO BAY: AN OVERVIEW.

Geological Survey, Menlo Park, Calif. Water Resources Div.

T. J. Conomos, and D. H. Peterson.
In: Estuarine Processes, Vol II; Circulation, Sediments, and Transfer of Material in the Estuary, 1977: Academic Press, Inc., New York, p 82-97, 1977. 6 fig, 1 tab, 41 ref.

Descriptors: *Sediment transport, *Particle size, *Water circulation, *Bays, *California, Sediment distribution, Suspension, Deposition(Sediments), Estuaries, Sediment load.
Identifiers: *San Francisco Bay, Sediment

resuspension.

Differences in the relative magnitude and timing of wind stress and river inflow in the northern and southern reaches of San Francisco Bay create different sedimentary conditions. The northern reach is a partially to well mixed estuary receiving most of the total annual fresh-water input (840 cubic meter/sec) and suspended sediment input (4 million metric tons) into the bay; more than 80% of the sediment is received during winter. Density-driven nontidal estuarine circulation (about 5 cm/sec) maintains a turbidity maximum which changes seasonally in particle concentration (40 to cm/sec) maintains a turbidity maximum which changes seasonally in particle concentration (40 to 80 mg/liter). Strong tidal currents (< or = 225 cm/sec) and wind-generated waves resuspend sediment from the shallow bay floor: some of the riverborne sediment deposited during winter is resuspended during summer and transported landward to the turbidity maximum. Long-term sediment data (extrapolated from bathymetric charts) indicate that the northern reach is an effective indicate that the northern reach is an effective sediment trap. In contrast, long-term sediment data suggest that the southern reach is experiencing net erosion. The southern reach receives little river inflow or riverborne suspended sediment, and the average nontidal circulation is weak (< or = 2 cm/sec). The principal source of suspended sediment (25 mg/liter) in the southern reach is the shallow bay floor (average depth 6 m). (Woodard-USGS) W77-08486

LONGITUDINAL DISTRIBUTION OF SELECTED MICRONUTRIENTS IN NORTHERN SAN FRANCISCO BAY DURING

Geological Survey, Menlo Park, Calif. Water Resources Div. For primary bibliographic entry see Field 5C. W77-08487

PHYTOPLANKTON PRODUCTION AND ENU-MERATION IN NORTHERN SAN FRANCISCO

BAY DURING 1972, Geological Survey, Menlo Park, Calif. Water Resources Div. For primary bibliographic entry see Field 5C. W77-08488

IMPLICATIONS OF SEASONAL CHEMICAL AND PHYSICAL FACTORS ON THE PRODUC-TION OF PHYTOPLANKTON IN NORTHERN SAN FRANCISCO BAY,

Geological Survey, Menlo Park, Calif. Water Resources Div. For primary bibliographic entry see Field 5C. W77-08489

PHOSPHORUS EXCHANGE AT THE SEDI-MENT-WATER INTERFACE OF SELECTED NARRAGANSETT BAY SEDIMENTS, Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W77-08502

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

STATUS OF REVERSE OSMOSIS DESALINA-Office of Water Research and Technology, Washington, D.C. Membrane Processes Div.

K. C. Channabasappa.
Desalination, Vol 17, p 31-67, 1975. 31 fig, 12 tab,

Descriptors: *Reverse osmosis, *Desalination apparatus, *Costs, *Reviews, Water treatment, Brackish water, Saline water, Sea water, Desalination, Membrane processes, Technology, Unit costs, Operating costs, Methodology, Thin films. Identifiers: Plugging index.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Saline Water Conversion—Group 3A

Reverse osmosis (RO), a relatively new technology, gradually is becoming as established and economical method for demineralization of saline waters. Over 50 commercial plants ranging in size from 50,000 gpd to 2 million gpd (2 mgd) are producing fresh quality water for municipal and in-dustrial uses from brackish water sources. Congress has authorized construction of a 100 med gress has authorized construction of a 100 mgd plant in Yuma, Arizona, to demineralize otherwise unusable high salinity irrigation return flows as part of the Colorado River Salinity Control. Engineering design and operation details, plant, were presented. A review of the plant operation data indicate that it is imperative for the plant owners and equipment suppliers to place due emphasis on revividing adequate feed water retreatment facili. providing adequate feed water pretreatment facilities and trained plant operation personnel to en-sure trouble-free operation and to achieve further economy in desalting costs. Significant advances have been made in the development of RO process for seawater desalination. Soaring energy costs a providing incentive for plant owners to prefer RO plants (up to 100,000 gpd) over vapor compression distillation hardware. Results of the Federal Government Desalting R and D Programs clearly indicate that RO desalting costs will be at least 20-30% lower than distillation. (Humphreys-ISWS)

TRANSFERENCE: A COMPREHENSIVE PARAMETER GOVERNING PERMEATION OF SOLUTES THROUGH MEMBRANES,

Alza Corp., Palo Alto, Calif.
F. Theeuwes, R. M. Gale, and R. W. Baker. Journal of Membrane Science, Vol. 1, No. 1, p 3-16, March 1976. 9 fig, 10 ref.

*Membrane Descriptors: *Membrane processes, *Permeability, *Laboratory tests, *Mathematical models, Diffusion, Membranes, Transfer, Analysis, Analytical techniques, Testing procedures, Sorption, Solutes, Measurement, Saturation. Identifiers: Ficks law, *Transference(Membrane processes).

Experimental studies of the diffusion of moderate molecular weight drugs through synethetic polymeric membranes has led to the definition of a new parameter to characterize solute permeation. The accepted parameter which describes transmembrane flux is permeability, P, defined as the product of the flux times the membrane thickness divided by the concentration difference across the membrane in the external solution. The new parameter described is called transference, T, and is defined as the mass of solute transferred from a saturated solution, under perfect sink conditions, across the membrane per unit time and area, multiplied by the thickness of the membrane. Regardless of whether there is solvent-membrane interaction or not, the permeability coefficient, P, for given solute and membrane differs from one solvent to another. In contrast, transference is independent of solvent, unless there is solvent-membrane interaction, in which case the inconsistency of transference for a particular solvent signifies that the membrane is modified by the presence of that solvent or solvent-solute combination. Therefore, transference is a more comprehensive parameter than permeability and is basic at the same time to solute-membrane permeation. When transference is introduced into Fick's law, it is obvious immediately that the flux of solute through the membrane, at equal fraction of saturation in any donor solvent, is equal and independent of the donor solvent in the absence of solvent-membrane donor solvent in the assence of solvent and interaction, when the solute has a constant solvent-membrane partition coefficient. Two examples of the use of the transference parameter were provided. (Humphreys-ISWS) W77-08231

PRODUCTION OF ENERGY FROM CONCENTRATED BRINES BY PRESSURE-RETARDED

OSMOSIS, 1. PRELIMINARY TECHNICAL AND

Ben Gurion Univ. of the Negev, Beersheba (Israel). Research and Development Authority. S. Loeb

Journal of Membrane Science, Vol. 1, No. 1, p 49-63. March 1976, 5 fig.

Descriptors: *Osmosis, *Electric power production, *Economics, *Membrane processes, Theoretical analysis, Foreign research, Brines, Saline water, Energy, Unit costs, Membranes, Electric power, Power plants.

Identifiers: *Israel, Pressure retarded osmosis.

Preliminary technical and economic correlations were made on the production of energy from con-centrated brines by Pressure-Retarded Osmosis (PRO). In PRO, the hydraulic pressure is less than the osmotic pressure, so that water flux is against the hydraulic pressure gradient, this fact being the basis for energy production. It is visualized that a PRO power plant, operating continuously, would pump a concentrated brine such as Dead Sea brine on the outside of the fibers in hollow fiber modules at a high hydraulic pressure. Simultaneously, Jor-dan River water or brackish springs would be pumped through the inside of the fibers and would permeate through the fiber wall into the pressurized brine. The permeate-enhanced brine would be depressurized through a hydroturbine, delivering net power equal to the high hydraulic pressure x the permeate rate, in the idealized case. A transport analysis indicated that an asymmetric mem-brane, with the brine on the skin side, is as desirable in PRO as it is in reverse osmosis from the standpoint of high water permeation flux. The mechanical efficiency of a PRO power was examined. The efficiency is very sensitive to the ratio of concentration brine rate to permeate rate, a low value of this ratio (Less than 2) being desirable. A preliminary analysis was made of the unit cost of energy production from a PRO plant. The results were expressed as a function of the ratio of concentrated brine to permeate rate, the water flux, and the hydraulic pressure used. The analysis indicated the desired course of experimentation to obtain data for calculation of the minimum unit energy costs. (Humphreys-ISWS) W77-08233

COMPUTER PREDICTION OF STATIONARY STATES OF MEMBRANES FROM DIF-FERENTIAL PERMEABILITIES.

Aberdeen Univ. (Scotland). Dept. of Chemistry. C. McCallum, and P. Meares. Journal of Membrane Science, Vol. 1, No. 1, p 65-98, March 1976. 19 fig, 4 tab, 27 ref.

Descriptors: *Membranes, *Mathematical models, *Membrane processes, *Theoretical analysis, Zeta potential, Permeability, Computer models, Ion exchange, Cation exchange, Electrodialysis, Osmosis, Computer programs, Foreign research, Diffusion, Evaluation. Identifiers: Computer flow diagrams.

It is desirable to be able to predict from data on the concentration-dependent permeabilities how a macroscopic membrane of known dimensions would perform under a given set of external conwound perform under a given set of external con-straints, e.g., when a predetermined current is passed through the membrane placed between par-ticular external solutions as in electrodialysis. A computational procedure was developed which enables the final steady-state under given constraints to be evaluated by an iterative procedure. The membrane is regarded as a hypothetical series array of slices of equal thickness. The number of slices has to be chosen sufficiently large that the difference in composition across any single slice is small enough for its behaviour to be described by the local coefficients appropriate to the mean com-position of the slice. The computation then adjusts the profiles across the whole membrane until each slice is in interfacial equilibrium with its neighbours and the imposed constraints are

satisfied. The required fluxes and forces are then evaluated without difficulty. Useful and informative by-products from the computations are the steady profiles of the intensive variables in the membrane. The profiles are not accessible direct measurement. The procedure was tested by calculating the osmotic and salt diffusion fluxes and the membrane potentials when the membrane separates different solutions at zero current and pressure difference. Although the computation pressure difference. Although the computation requires the inversion of a 60 x 60 square matrix in most cases, the results were found to agree satisfactorily with those obtained experimentally. The procedure has been used to generate fluxes when an electric current is passed between different solutions as in electrodialysis. The data show how the membrane properties in electrodial-ysis depend on the current density, external concentrations and membrane thickness in a more precise way than has been available hitherto. The membrane profiles were found to exhibit a very pronounced dependence on the current density. (Humphreys-ISWS) W77-08234

THERMOCOMPRESSION-TYPE APPARATUS FOR DESALTING SALINE WATER,

FOR DESALING SALINE WATER, Societa Italiana Resine S.p.A., Milan (Italy). D. Barba, F. Concari, and G. Spizzichino. U.S. Patent No. 3,997,408, 10 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 953, no 2, p 710, December 14, 1976.

Descriptors: *Patents, *Desalination, *Saline water, *Demineralization, *Waste water treatment, *Water purification, Separation techniques, Water softening, Equipment. Identifiers: Steam compression.

A desalting apparatus operates on the principle of thermocompressione, otherwise known as steam-compression. In such apparatus the saline water is caused to flow on a heat-exchange surface; the temperature of the stream produced in this manner is increased by means of a compressor and the compressed stream is used to heat the heatcompressed sheaft is used to heat the heat-exchange surface by yielding its condensation heat. The condensate is recovered and provides soft water. The purity of the produced soft water depends upon the efficiency with which the steam is separated from its entrained microscopic droplets of the saline water. A specific object is to provide a thermocompression desalter in which fluted tubes may be utilized in the evaporator without a substantial risk of incrustations. The apparatus comprises: an evaporator section includ-ing a heating chamber and a bundle of evaporator tubes crossing the chamber; means for circulating saline water throught the tubes of the bundle including a separating chamber in which the steam produced in the evaporator section is separated from the non-evaporated saline water. A compressor delivers steam at an increased pressure to the heating chamber and condensate is recovered from the heating chamber. (Sinha-OEIS) W77-08252

FORWARD OSMOSIS EXTRACTORS,

National Univ., Tucson. School of Renewable Natural Resources.
C. D. Moody, and J. O. Kessler.
Desalination, Vol 18, p. 283-295, 1976. 1 fig, 14 ref.
OWRT B-053-ARIZ(2), 14-34-0001-7137.

Descriptors: *Water reuse, Kinetics, Design, Sea water, *Osmosis, *Desalination, *Waste water treatment, Model studies, Mathematical models, *Permselective membrane's, *Separation techniques, Membrane processes. Identifiers: *Forward osmosis.

Osmosis occurs when two solutions of differing osmolar concentrations are separated by a mem-brane permeable to the solvent but not (or nearly not) to the solutes. Derived is the relationship between the kinetics and design for the purpose of

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation In Agriculture

amounts of deficits over that obtained by the scheduling-withoutgforecasts model but did not significantly decrease the amounts of applied irrigation or excesses below that of the schedulingwithout-forecasts model. A further study was made to determine the effects on model performance of changing the acceptance level in the scheduling-with-forecasts model. The optimum value for acceptance level was 0.80. The scheduling-with-forecasts model using acceptance level of 0.80 resulted in significant decreases in amounts of applied irrigation and excesses without significant increases in amounts of deficits over those resulting from the scheduling-without-forecasts model.
W77-08343

FROM GOOD HUSBANDRY TO REASONABLE USE: ILLINOIS SURFACE WATER DRAINAGE LAW EVOLVES IN SUBDIVISION CASE, For primary bibliographic entry see Field 4A.

WATER FOR FOOD - OR FOR MORE IMPOR-TANT PURPOSES. (REALLOCATION OF IR-RIGATION WATER TO CITIES AND INDUS-

Wyoming Univ., Laramie. Coll. of Law. For primary bibliographic entry see Field 6E.

IRRIGATION AND IRRIGATION DISTRICTS. For primary bibliographic entry see Field 6E. W77-08396

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, VOLUME I-A, TECHNICAL SESSION PRESENTATIONS, AGRICULTURE-ENVIRON-

National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center. For primary bibliographic entry see Field 7B. W77-08408

AGRICULTURAL INVENTORY CAPABILITIES OF MACHINE PROCESSED LANDSAT DIGITAL DATA,

General Electric Co., Beltsville, Md. Space

Systems Organization.
D. L. Dietrich, R. E. Fries, and D. D. Egbert.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 221-232, September 1975. 8 fig, 2 tab, 3 ref.

Descriptors: *Vegetation, *Remote *Classification, *North Dakota, *Canada, Monitoring, Standing crops, Agriculture, Census, Crops, Grains(Crops), Surveys, Spatial distribution, Satellites(Artificial), Mapping, Areal, Evaluation, Measurement, Data processing, Analytical techniques.
Identifiers: *Saskatchewan(Canada), LANDSAT.

Agricultural crops identification and acreage determination analysis of LANDSAT digital data were performed in Williams County, North Dakota, and Melfort, Saskatchewan, Canada. A multispectral image processing and analysis system was utilized to perform the man-machine interactive analysis. The developed techniques yielded crop acreage estimate results with accuracy greater than 90% and as high as 99%. These results are encouraging evidence of agricultural inventory capabilities of machine-processed LAND-SAT digital data. (Humphreys-ISWS) W77-08423 (See also W77-08408)

AGRICULTURAL APPLICATIONS OF REMOTE SENSING--A TRUE LIFE ADVEN-TURE, General Electric Co., Beltsville, Md.

E. S. Schaller.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 233-238, September 1975.

Descriptors: *Remote sensing, *Agriculture, *Mapping, *California, Crops, Spatial distribution, Classification, Census, Vegetation, Farm management, Cotton, Aerial photography, Satellites(Artificial).

Identifiers: *San Joaquin Valley(Calif), LAND-

In mid-1973, General Electric undertook a study of agricultural applications of remote sensing with a major agricultural firm. The study continued for eighteen months and covered the areas of crop monitoring and management as well as large-scale crop inventories. Pilot programs in the application of aircraft remote sensing and LANDSAT data were conducted. An operational aircraft survey program for ranch management has subsequently been implemented by the agricultural firm. LANDSAT data were successfully used to produce a 97% accurate inventory of cotton over 4.8 million acres of California's San Joaquin Valley. (See also W77-08408) (Humphreys-ISWS) W77-08424

PRACTICAL APPLICATION OF REMOTE SENSING IN AGRICULTURE,

Anderson, Clayton and Co., Houston, Tex. R. A. Phelns.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 239-242, September 1975. 10 ref.

Descriptors: *Remote sensing, *Agriculture, *Mapping, *Crops, *Arizona, Cotton, Aerial photography, Farm management, Vegetation, Spatial distribution, Molds, Satellites(Artificial). Identifiers: LANDSAT.

During the past few years, Anderson, Clayton and Company has utilized in their remote sensing program imagery from several types of platforms from light aircraft to the LANDSAT (ERTS) satellites. Inexpensive imagery was preferred over expensive magnetic tapes. Emphasis was on practical application of remote sensing data to increase crop yield by decreasing plant stress, disease, weeds, and undesirable insects, and by improving irrigation. Imagery obtained from low altitudes via aircraft provided the necessary resolution and complements but did not replace data from high altitude aircraft, Gemini and Apollo spacecraft, Skylab space station, and LANDSAT satellites. Federal government centers are now able to supply imagery within about thirty days from date of order and deserve to be commended. Nevertheless, if the full potential of space imagery in practi-cal agricultural operations is to be realized, the time span from date of imaging to user application needs to be shortened from the current several months to not more than two weeks. (See also W77-08408) (Humphreys-ISWS) W77-08425

AN OVERVIEW OF THE DEVELOPMENT OF REMOTE SENSING TECHNIQUES FOR THE SCREWWORM ERADICATION PROGRAM,

National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center. C. M. Barnes, and F. C. Forsberg. In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session

Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 263-287, September 1975. 16 fig, 8 ref.

Descriptors: *Insect control, *Remote sensing, *Environment, *Texas, *Mexico, Land use, Satellites(Artificial), Climatic data, Weather data, Analytical techniques, Environmental effects, Entomology, Air temperature.

Identifiers: Screwworm, *Screwworm eradica-

The paper reported the current status of remote sensing techniques developed for the screwworm eradication program of the Mexican-American Screwworm Eradication Commission. A review of the type of data and equipment used in the pro-gram was presented. Future applications of remote sensing techniques were considered. (See also W77-08408) (Humphreys-ISWS) W77-08427

RELATIONSHIP BETWEEN CORN YIELD, EX-PRESSED AS A PERCENTAGE OF MAXIMUM, AND THE N PERCENTAGE IN THE GRAIN, I. VARIOUS N-RATE EXPERIMENTS,

Iowa Agricultural and Home Economics Experiment Station, Ames. W. H. Pierre, L. Dumenil, V. D. Jolley, J. R.

Webb, and W. D. Shrader. Agronomy Journal, Vol. 69, p 215-220, March-April 1977. 1 fig, 3 tab, 23 ref.

Descriptors: *Corn(Field), *Crop production, *Nitrogen, *Geographical methods, *Regression analysis, *Iowa, Model studies, Economic impact,

Moisture stress, Productivity.
Identifiers: *Nitrogen percentage, Nitrogen sufficiency, Relative yield, Maximum yield.

A graphical method and a regression method were developed to relate corn (Zea mays L.) yield, expressed as a percentage of maximum, and the grain's N percentage. Data used came from 13 site-years of 6 N-rate experiments in Iowa and from previous literature. There was good agreement between the two methods for determining maximum yields and N percentages at various propor-tions of maximum yield. Average critical N percentages (those at maximum yield) were 1.52% for the graphical and 1.54% for the regression method in Iowa experiments. Data calculated from reported experiments were in general agreement with the Iowa results. Some variability in compared experimental results may have been attributable to differences among the 23 hybrids represented. There was little or no demonstrable effect on the relative yield-percent N relationship due to moisture stress, plant density or adequacy of other nutrients. That relationship offers a basis for estimating N sufficiency and the N require-ment for maximum yield or an economic optimum yield. (Jahns-Arizona) W77-08456

GROWTH OF TROPICAL AND TEMPERATE GRASSES AT PALMERSTON NORTH WARM-SEASON YIELDS WITH A WITHOUT IRRIGATION, Department of Scientific and Industrial Research,

Palmerston North (New Zealand). Plant Physiolo-

gy Div. B. J. Forde, C. R. Slack, P. G. Roughan, and H. C. M. Whitehead.

New Zealand Journal of Agricultural Research, Vol. 19, No. 2, p 135-142, 1976. 5 tab, 16 ref.

Descriptors: *Grasses, *Crop production, *Photosynthesis, *Soil moisture, Irrigation, Tropical regions, Plant physiology, Leaves, Moisture tension, Field capacity, Fertilizers, Soil water, Irrigation effects, Water shortage, Bermudagrass, Flowering, Range management, Grazing, Tem-

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4 Control Of Water On The Surface—Group 4A

Experiments were conducted on several species of grasses in New Zealand to determine the most suitable for highest yield of summer growth. Summer production of temperate grasses is limited by inadequate water supply, supra-optimal day temperatures and dormancy after spring flowering. In the warmer areas of New Zealand, the summer growing tropical grasses paspalum and kikuyu contribute significantly to annual pasture yields. Both, however, are difficult to manage. There are other tropical grasses which could possibly be cultivated in New Zealand. These grasses possess Carbon 4 photosynthesis pathways, whereas the temperate grasses fix carbon by the Carbon 3 pathway. Studies suggest that Carbon 4 pathway grasses may result in more economical use of available soil moisture. Warm season yields of 14 Carbon 4 photosynthetic pathway tropical grasses were compared with yields of 6 Carbon 3 pathway temperate grasses, and observations were made on the extent of flowering and on frost sensitivity and the results and observations were made on the extent of flowering and on frost sensitivity and the results reported. Results show that tropical grasses can give a substantially higher yield over the summer than the temperate pasture grasses in current use. However, a more accurate assessment of the role of selected tropical grasses in New Zealand as perennial, summer-producing forage species must await further study. (Jamail-Arizona) wait rurus W77-08457

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POTENTIAL OF NEW SUMMER GRASSES IN NORTHLAND: I. WARM-SEASON YIELDS UNDER DRYLAND AND IRRIGATION,

Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiolo-

y Div. A. O. Taylor, J. A. Rowley, and B. J. Hunt. New Zealand Journal of Agricultural Research, Vol. 19, No. 2, p 127-133, 1976. 1 fig, 5 tab, 9 ref.

Descriptors: *Irrigation effects, *Range management, *Crop production, *Grasses, Pastures, Irrigation, Soil types, Irrigation efficiency, Droughts, Rainfall, Grazing, Tropical regions, Photosynthesis, Feeds, Plant growth, Evapotranspiration, Leaching. piration, Leaching. Identifiers: Paspalum, Kikuyu.

The warm-season yield of a range of Carbon 4 photosynthetic pathway summer-growing tropical grasses was measured by mechanical harvesting over three seasons in small plot trials in New Zealand under high levels of nutrition and pest con-trol. Several of the grasses produced higher yields than the naturalized summer grasses paspalum and kikuyu. Irrigation sufficient to replace evaporative kukuyu. Irrigation sufficient to replace evaporative water loss substantially increased the early summer production of all grasses but usually decreased their early autumn production. Leaching of soil nutrients may have been partially responsible for the poor autumn production under irrigation. The grasses varied widely in their relative yield response to irrigation. Production of all grasses persisted reasonably well under the five week harvest interval and 5 or 10 centimeter week narvest interval and 5 or 10 centimeter cutting height, although those with some degree of stoloniferous habit were generally better than bunch types. The experiments provide preliminary data on the yield potential of a range of Carbon 4 grasses in New Zealand and demonstrate that several types can maintain acceptable yields for at least three years in a coastal environment under lax cutting conditions. (Jamail-Arizona) W77-08458

IMPROVING FOOD CROP PRODUCTION IN THE SUDAN SAVANNA ZONE OF NORTHERN NIGERIA, Institute for Agricultural Research, Zaria

A. H. Kassam, M. Dagg, J. M. Kowal, and F. H.

Outlook on Agriculture, Vol. 8, No. 6, p 341-347, 1976. 2 fig, 1 tab, 45 ref.

Descriptors: *Crop production, *Water requirements, *Foods, *Rainfall, Africa, Crops, Precipitation(Atmospheric), Soil erosion, Agriculture, Droughts, Climates, Evaporation, Evapotranspiration, Soil moisture, Sorghum, Fertilizers, Farm management, Crop response. Identifiers: *Nigeria(Sudan Sayanna zone).

The potential for increasing food production in the Sudan Savanna of Northern Nigeria is discussed. This area has generally been considered marginal for crop production because of lack of available water, among other factors. However, studies have shown that the area has potential for food crop production. One of the main features of the Sudan agricultural zone is its low crop productivity per unit of land, which has not increased over ty per unit of land, which has not increased over the past thirty years or more. Economic and social pressures are making greater demands on soil resources of the area. There seems little doubt that the application of simple, but improved, technology can result in increased levels of production. The effects of improved crop science, mechanization, and climate on the area are discussed. The water and climate on the area are discussed. The water requirements are outlined. The major crops grown, sorghum, millet, cowpea, and groundnuts, as well as diseases to which these crops are susceptible, are discussed. The conclusions presented suggest that better organization and more efficient methods should be applied to the problems faced by the region. (Jamail-Arizona) W77-08459

INFLUENCES SIMULATED THE INFLUENCES OF SIMULATED MOISTURE STRESS CONDITIONS AND OSMOTIC SUBSTRATES ON GERMINATION AND GROWTH OF CULTIVATED AND WILD

SAFFLOWERS, Pahlavi Univ., Shiraz (Iran). Coll. of Agriculture. For primary bibliographic entry see Field 2I. W77-08460

4. WATER QUANTITY MANAGEMENT AND CONTROL.

4A. Control Of Water On The Surface

CITIZEN PARTICIPATION IN COMPREHEN-SIVE WATER RESOURCES PLANNING Massachusetts Univ., Amherst. Inst. for Man and For primary bibliographic entry see Field 6B. W77-08105

INVENTORY OF COLORADO'S FRONT RANGE MOUNTAIN RESERVOIRS, Colorado State Univ., Fort Collins. Dept. of For primary bibliographic entry see Field 6B. W77-08107

FEDERAL STATUTORY MODIFICATION OF PRIVATE WATER RIGHTS IN SOUTH

Florida Univ., Gainesville. School of Law. For primary bibliographic entry see Field 6E. W77-08112

CAN A STATE EMBARGO THE EXPORT OF WATER BY TRANSBASIN DIVERSIONS, Washington Univ., Seattle. School of Law. For primary bibliographic entry see Field 6E. W77-08129

WELLS, PUMPING PLANTS, CONDUITS AND STREAMS, For primary bibliographic entry see Field 6E. W77-08154

BEAR RIVER COMPACT, For primary bibliographic entry see Field 6E. W77-08155

MEASUREMENT OF FLASH FLOODS IN THE UNITED STATES-STATE OF THE ART, Geological Survey, Reston, Va. Water Resources For primary bibliographic entry see Field 2E. W77-08161

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1975, Geological Survey, Indianapolis, Ind. Water Resources Div. For primary bibliographic entry see Field 7C. W77-08162

ON THE RELATIONSHIP BETWEEN THE FINITE ELEMENT AND FINITE DIFFERENCE METHODS, Survey, Trenton, N.J. Water

Resources Div.
For primary bibliographic entry see Field 7A.
W77-08168

SIMULATION OF STREAMFLOW OF FLAMBEAU RIVER AT PARK FALLS, WISCONSIN TO DEFINE LOW-FLOW CHARACTERISTICS, Geological Survey, Madison, Wis. Water Resources Div. For primary bibliographic entry see Field 2E. W77-08172

HYDROLOGIC EFFECTS OF THE TAMPA BYPASS CANAL SYSTEM, Geological Survey, Tallahassee, Fla. Water Resources Div.

L. H. Motz. Florida Bureau of Geology, Tallahassee, Report of Investigations No 82, 1975. 42 p. 22 fig. 4 tab, 19

Descriptors: *Flood control, *Canals, *Diversion, *Florida, *Surface-groundwater relationships, Water levels, Aquifers, Hydrologic aspects, Hydrogeology, Model studies. Identifiers: *Tampa Bypass Canal(Fla).

Flood water of the Hillsborough River will be diverted at a point upstream from areas of flood-plain encroachment in the cities of Tampa and Temple Terrace into nearby McKay Bay by means of the Tampa Bypass Canal System, which is being built through an area east of Tampa. The canal system will breach the underying artesian Floridan aquifer in places where the potentiomet-ric surface is at or near land surface, causing draw-downs over a wide area and diverting flow from other parts of the hydrologic system. A water-con-trol structure would maintain the pool level in the trol structure would maintain the pool level in the Eureka Springs and Harney Flats areas at a significantly higher level than without the structure, reducing drawdowns in and discharge from the Floridan aquifer in these areas. The canal system, as presently designed, will lower water levels in the Floridan aquifer by 1.0 foot or more over a 50 to 90 square mile area and will result in a discharge from the aquifer into the canal system of about 13 to 22 mg. This discharge will be equal to a decrease in the discharge from other parts of the hydrologic system. By adding an additional control structure near Buffalo Avenue, the affected area could be reduced 45 to 50 percent, and the discharge could be reduced 40 to 45 percent. (Woodard-USGS) W77-08182

SELECTED HYDROLOGIC DATA, UINTA BASIN AREA, UTAH AND COLORADO, Geological Survey, Salt Lake City, Utah. Water For primary bibliographic entry see Field 7C. W77-08183

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

WATER RESOURCES DATA FOR ILLINOIS, Survey, Champaign, Ill. Water Geological Resources Div. For primary bibliographic entry see Field 7C. W77-08184

WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1975, Geological Survey, Carson City. Nev. Water Resources Div. For primary bibliographic entry see Field 7C. W77-08185

ASPHALT-RUBBER MIXTURES FOR SEEPAGE

CONTROL, Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics R. M. Kalash.

M.S. Thesis, 1977. 81 p, 24 fig, 5 tab, 25 ref, 2 append. OWRT A-075-ARIZ(1), 14-34-0001-7006.

Descriptors: *Seepage control, Water harvesting, *Asphalt, *Rubber, Water conservation, Testing procedures, Physical properties, Permeability, Membrane, Adsorption, Viscosity, Tensile Membrane, Adsorption, Viscosi strength, Water yield improvement. Identifiers: *Waterproof membranes.

A laboratory investigation was made of asphaltrubber for use in water seepage control applica-tions. Laboratory testing utilized for physical property determinations included viscosity, creep (tensile), ductility (ASTM D113-74), water vapor transmission (ASTM E96-72), Procedure Bw), water absorption (ASTM 570-72), and permeability. The results showed that the asphalt-rubber is relatively impermeable as a membrane. Physical properties of the base asphalt that are increased with the addition of rubber include water absorption and viscosity. The test that exhibited lower physical property values was ductility. Compared with plain asphalt, creep (tensile) test results showed that the rate of deformation of asphaltrubber mixtures depends on the magnitude of the tensile load applied. W77-08195

PUMPED STORAGE POTENTIAL OF THE HELLS CANYON AREA.

Idaho Univ., Moscow. Dept. of Civil Engineering. For primary bibliographic entry see Field 8C. W77-08196

THE INFLUENCE OF PRECIPITATION ON BIOCHEMICAL OXYGEN DEMAND ON NINE STREAMS IN NEW JERSEY, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geography. For primary bibliographic entry see Field 5B.

W77-08203

IMPLEMENTATION OF AN OPTIMIZATION MODEL FOR OPERATION OF A
METROPOLITAN RESERVOIR SYSTEM,
Southern Methodist Univ., Dallas, Tex. School of
Engineering and Applied Science.

Water Resources Bulletin, Vol. 13, No. 1, p 57-70, February 1977. 6 tab, 19 ref. OWRT C-3355(3739)

*Operations, Descriptors: *Reservoirs, *Optimization, *Dynamic programming, *Economic efficiency, Water supply, Computer models, Reservoir releases, Equations, Opera-*Dynamic

tions research, Water distribution (Applied), Simulation analysis, *Texas.

Identifiers: "Dallas reservoir system(Tex), *Multiple reservoirs, *Optimal operation, Sectioning search, Water withdrawal, Cost minimization.

A deterministic dynamic programming optimiza-tion model with a refining sectioning search procedure is developed and implemented to derive minimum cost withdrawal and release patterns for water supply from a multiple reservoir system serving the Dallas metropolitan area. Applications are made to the four reservoir system operated by this city. A realistic cost structure, including nonlinear power consumption, block rate unit power costs, and flow dependent power consumption for intracity water distribution, is utilized. Applications are made to find least cost operating patterns and, as well, by inclusion of a water loss penalty function supply patterns which will reduce evaporation water losses for the Dallas system. The model is viewed as an envolved tool which can be refined and improved as greater familiarity with it is gained by City personnel. (Bell-Cornell). W77-08211

LOW FLOW ANALYSES OF STREAMS: DETAILS OF COMPUTATIONAL DETAILS PROCEDURES AND ANNOTATED BIBLIOG-

Monash Univ., Clayton (Australia), Dept. of Civil Engineering. For primary bibliographic entry see Field 2E. W77-08219

ALTERNATIVE MEASURES OF RIVER CHAN-NEL SHAPE AND THEIR SIGNIFICANCE. Papua and New Guinea Univ., Port Moresby (New

Guinea). Dept. of Geography.
For primary bibliographic entry see Field 8B. W77-08241

THE FLOODING OF RIVERS IN THE USSR AND THE MEASURES TAKEN TO CONTROL ICE JAMS (LES INONDATIONS FLUVIALES EN URSS ET LA LUTTE CONTRE LES CRUES CAUSEES PAR LES EMBACLES), Akademiya Nauk SSSR, Moscow. Institut Vod-

nykh Problem For primary bibliographic entry see Field 2C.

THE OPERATION OF A FLOOD WARNING NETWORK: ITS USE FOR STUDYING FLASH FLOODS (EXPLOITATION D'UN RESEAU D'ALERTE: SON UTILISATION POUR D'ALERTE: SON UTILISATIO L'ETUDE DES CRUES BRUTALES),

Division des Resources en Eau, Tunis (Tunisia). For primary bibliographic entry see Field 2E. W77-08248

A METHODOLOGY FOR MEASURING FLASH FLOODS (METHODOLOGIE POUR LA ME-SURE DES CRUES BRUTALES), Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). For primary bibliographic entry see Field 2E. W77-08249

RECENT FLASH FLOODS OF THE DISON BROOK (CRUES BRUTALES RECENTES DU 'RUISSEAU' DE DISON (BELGIQUE): OBSER-

VATIONS ET PREVISIONS), Liege Univ. (Belgium), Faculte des Sciences Appliquees. R. Spronck

In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 9-16, 1974. 4 fig. 5 tab, 11 ref.

Descriptors: *Flash floods, *Watersheds(Basins), *Rainfall, *Data collections, Precipita-tion(Atmospheric), Rainfall disposition, Rainfall intensity, Time, Duration curves, Frequency curves, Frequency, Foreign countries. Identifiers: *Belgium, *Dison Brook(Belgium).

A large number of short but severe floods have occured in the watershed of the small brook of Dison. Therefore, the authorities have decided to undertake important flood control measures. Engineers affiliated with interested bodies have been enlisted to carry out preliminary studies and to forecast maximum discharges. Furthermore, the legal action brought by certain riverside residents has resulted in several investigations and surveys. Although rainfall measurements in the studied region have been sufficiently numerous, the same cannot be said for maximum discharges, which have been estimated indirectly. In this situation, it is necessary to synthesize the general data available. (See also W77-01933) (Humphreys-ISWS) W77-08250

IMPROVING INSTITUTIONAL ARRANGE-MENTS FOR WATER DEVELOPMENT IN THE STATE OF WASHINGTON: DEVELOPMENTAL AND ENVIRONMENTAL TRADE-OFFS AND CONSTRAINTS.

Washington Univ., Seattle. Inst. of Governmental For primary bibliographic entry see Field 6E. W77-08284

REGIONAL SIMULATION OF STREAMFLOW

DATA, North Carolina Univ., Raleigh. Dept. of Biological and Agricultural Engineering. For primary bibliographic entry see Field 2A. W77-08298

A WATER MANAGEMENT MODEL FOR HIGH WATER TABLE SOILS,

North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering. For primary bibliographic entry see Field 3F. W77-08301

FLOOD MANAGEMENT: WHO BENEFITS AND WHO PAYS.

Massachusetts University, Amherst. Dept. of Food and Resource Economics. For primary bibliographic entry see Field 6F. W77-08303

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS: ECONOMIC, LEGAL, AND FINAN-CIAL ASPECTS,
Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. For primary bibliographic entry see Field 6B. W77-08345

INPUT-OUTPUT MODELING IN WATER RESOURCES SYSTEM PLANNING. Colorado State Univ. Fort Collins. Dept. of Civil

Engineering For primary bibliographic entry see Field 6A. W77-08346

CHANNELIZATION: ENVIRONMENTAL, GEOMORPHIC AND ENGINEERING ASPECTS, North Carolina Univ. at Charlotte. Dept. of Geography and Earth Science. For primary bibliographic entry see Field 8D. W77-08352

FROM GOOD HUSBANDRY TO REASONABLE USE: ILLINOIS SURFACE WATER DRAINAGE LAW EVOLVES IN SUBDIVISION CASE, J. Fry.

Chicago-Kent Law Review, Vol 52, No 1, p 169-

Descriptors: *Illinois, *Surface drainage, *Natural flow doctrine, *Reasonable use, *Diversion, Urban drainage, Relative rights, Agricultural ru-

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Control Of Water On The Surface—Group 4A

noff, Urban runoff, Urban sociology, Legal aspects, Riparian rights, Water law, Water rights, Natural flow, Flow, Alteration of flow, Surface runoff, Central U.S. Identifiers: *Absolute liability, *Common enemy rule, Good husbandry exception.

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Until the recent Illinois Supreme Court decision of Templeton v. Huss, the natural flow rule governed the drainage of unwanted surface water. This civil law rule imposed strict liability for injury to another's land resulting from any interference with the natural flow of surface waters. However, since the rule impeded agricultural development the Illinois court declared a good husbandry exaction. The exception allowed for an increase in the limois court declared a good husbandry ex-ception. The exception allowed for an increase in drainage to improve and till higher lands, but strictly prohibited diversion from the natural course of drainage. Proof of diversion was essen-tial to recovery unless the increased drainage flow totally destroyed the lower lands. Huss appears to modify the natural flow rule by implementing a policy of reasonable use, which negates the necessity for proof of diversion. This policy shifts the emphasis from one favoring agricultural develop-ment to one in which the interests of both the developer and those harmed by the development are balanced. However, the balancing test will not be applicable in all drainage situations since the holding only involved an urban subdivider's liabilinotating only involved an urban subortiver's a non-ty, and therefore cannot be extended to agricul-tural development. This article explores possible factual applications of the holding and interpreta-tion of the test employed. (Anderson-Florida) W77-08353

A NEW MEASURE OF DAMAGE FOR WRONG-FULLY APPROPRIATED WATER,

R. R. Douglas. Arizona State Law Journal, Vol 1975, p 565-84 (1975). 129 ref.

*Prior *Preferences(Water rie appropriation, *Remedies. Descriptors: "Prior appropriation, "Preferences(Water rights), "Remedies, "Penalties(Legal), Legal aspects, Water law, Water rights, Diversion, Legislation, Judicial decisions, Priorities, Water resources development, Management, Alternative water use, Economics, Alternative costs, State governments, Regulation. Identifiers: Taking(Legal), Presumptive damage rate. Descriptors:

The author examines traditional water law damage measures, and analyzes their strengths and shortcomings, and suggests possible alternatives. While public policy in the west has long approved the prior appropriator, judicially established and en-forced damage measures for wrongful deprivations of water have often, at least tacitly, favored illegal takings. Damages for permanent depriva-tions have not been carried to their logical legal tions have not been carried to their logical legal conclusion. The measures for temporary takings have tied water values to land values and have failed to recognize alternative uses of the water right. It is suggested that a water right be valued in its highest and best use and that strict liability should be imposed for the taking or destruction of a water right. Alternatively, a system for establish-ing a presumptive damage measure at the going rate for water in a given area is proposed. Finally, the equities and convenience of application of the proposed new measures are discussed and contrasted with present damage measures. A pre-sumptive damage rate based on the established cost of water in the area would provide realistic relief for the deprivation of water rights protected by the state's constitution and statutes. (Rieck-Florida) W77-08361

PUBLIC RIGHTS IN PENNSYLVANIA WATERS.

Pennsylvania Dept. of Environmental Resources, Harrisburg. Office of Enforcement. For primary bibliographic entry see Field 6E. W77-08362

FLOOD PLAINS FOR OPEN SPACE AND

RECREATION.

Bureau of Outdoor Recreation, Washington, D. C.

For primary bibliographic entry see Field 6F.

W77-08374

RESTLESS RIVER: INTERNATIONAL LAW AND THE BEHAVIOR OF THE RIO GRANDE, Texas Univ. at Austin. Dept. of Geography. For primary bibliographic entry see Field 6E.

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, VOLUME I-A, TECHNICAL SESSION PRESENTATIONS, AGRICULTURE-ENVIRON-

PRESENTATIONS, AGRICULTURE-ENVIRON-MENT.
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center. For primary bibliographic entry see Field 7B. W77-08408

ESTIMATING VEGETATIVE BIOMASS FROM LANDSAT-1 IMAGERY FOR RANGE MANAGE-MENT.

Nebraska Univ., Lincoln. Conservation Survey

Div.
P. M. Seevers, J. V. Drew, and M. P. Carlson.
In: Proceedings of the NASA Earth Resources
Survey Symposium, June 1975, Technical Session
Presentations, Agriculture-Environment, Volume
I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 1-8, September 1975. 1 fig, 2 tab, 6 ref.

Descriptors: *Estimating, *Range management, *Nebraska, *Remote sensing, *Vegetation regrowth, Vegetation, Agriculture, Measurement, *Biomass, Management, Land use, Mapping, Vegetation establishment, Data processing, Ranges, Grasses, Range grasses, Satel-Ranges, Grasses, Ra lites(Artificial). Identifiers: *LANDSAT.

Evaluation of LANDSAT-1, band 5 data for use in estimation of vegetative biomass for range management decisions was carried out for five selected range sites in the Sandhills region of Nebraska. Analysis of sets of optical density-vegetative biomass data indicated that com-parisons of biomass estimation could be made within one frame, but not between frames without correction factors. There was high correlation among sites within sets of radiance value-vegeta-tive biomass data and also between sets, indicating that comparisons of biomass could be made within one frame, but not between frames without correction factors. There was high correlation among sites within sets of radiance value-vegetative biomass data and also between sets, indicating that comparisons of biomass estimation could be made within one frame, but not between frames without correction factors. There was high correlation among sites within sets of radiance value-vegetative biomass data and also between sets, indicating that comparisons of biomass could be made within and between frames. LANDSAT-1 data were shown to be a viable alternative to currently used methods of determining vegetative biomass production and stocking rate recommendations for Sandhills rangeland. To be of maximum benefit, however, LANDSAT data must be available to decision makers within seven to ten days after acquisition. (See also W77-08408) (Humphreys-ISWS) W77-08409

DISCRIMINATING COASTAL RANGELAND PRODUCTION AND IMPROVEMENTS WITH COMPUTER AIDED TECHNIQUES, Lockheed Electronics Co., Inc., Houston, Tex. Aerospace Systems Div. C. A. Reeves, and D. P. Faulkner.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 9-17, September 1975. 4 fig, 4 ref.

Descriptors: *Range management, *Remote sensing, *Texas, *Coasts, Coastal marshes, Land use, Vegetation, Classification, Data processing, Satellites(Artificial), Ranges, Mapping, Measurement, Computers. Identifiers: LANDSAT.

This study successfully demonstrated that broad rangeland types can be accurately separated to ac-ceptable levels on LANDSAT bulk data with a computer aided classification procedure. Although computer aneed classification procedure. Although this was a pilot study, the output classification could be used by land managers as an input to their rangeland inventory. It was also determined that this first step just 'scratched the surface' in ex-tracting inventory information. A second step to further refine the classification is needed to differentiate improved pastures from the native ran-gelands. A third step would be to monitor changes as native rangelands are converted to improved pastures and as climatic or seasonal aspects in-fluence these lands. These steps are necessary for the development of a dynamic model based on inputs from remotely sensed data and to predict variations in carrying capacity of rangelands as af-fected by seasonal variations and range improvement practices. This model could take advantage of the unique multispectral and repeat coverage characteristics of the LANDSAT type satellites. The product of this model have the potential of aiding the range manager to become a more effi-cient and more accurate decision maker at lower cost. (See also W77-08408) (Humphreys-ISWS) W77-08410

USEFULNESS OF LANDSAT DATA FOR MONI-TORING PLANT DEVELOPMENT AND RANGE CONDITIONS IN CALIFORNIA'S ANNUAL GRASSLAND,

Geological Survey, Sioux Falls, S. Dak. EROS Data Center.

D. M. Carneggie, S. D. DeGloria, and R. N. Colwell.

Colwell.

In: Proceedings of the NASA Earth Resources
Survey Symposium, June 1975, Technical Session
Presentations, Agriculture-Environment, Volume
I-A. Report No. NASA TM X-58168, Symposium
held June 9-12, 1975, Houston, Texas, p 19-41,
September 1975. 5 fig, 10 ref, 3 plate.

Descriptors: *Range management, *Grasslands, *Remote sensing, *California, Monitoring, Ranges, Land use, Vegetation, Growth rates, Growth stages, Mapping, Forages, Plant growth, Data processing, Satellites(Artificial).

Identifiers: LANDSAT.

LANDSAT imagery and magnetic tapes were analyzed to determine their utility for monitoring and assessing range condition within the annual grassland in California. LANDSAT data, forage samples at selected range sites, and ground spec-tral reflectance data were all examined in order to tral reflectance data were all examined in order to verify the usefulness of LANDSAT imagery (1) for determining range condition and growth stage, and (2) for assessing relative forage production. The results of ground spectral reflectance data compared with green forage production data showed a close correspondence between spectral reflectance ratios and green biomass. Changes in crowned castern reflectance and production and control of the control of the same coverned. ground spectral reflectance data also correspond ground spectral reflectance data also correspond with observed changes in growth stage and condition of the forage species. Moreover, LANDSAT spectral reflectance data provides quantitative signals of significant growth stages in the development of annual forage species. Relative differences in forage production are also indicated by the LANDSAT spectral radiance data. Provided that cloud-free LANDSAT coverage is available during critical growth stages of the annual plants,

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

LANDSAT data can be used to: (1) assess differences in range condition on a regional basis; (2) compare differences in production between grazing regions for a given year; and (3) compare dif-ferences in condition and production for a given site between years. Moreover, the length of the green feed period can be determined; and this in-formation, along with ground samples of forage rormation, along with ground samples of forage production and climatic data, can provide the inputs to simple models for estimating forage production or for determining the remaining length of the green feed period beyond a definable threshold date late in the growth cycle of the annuals. (See also W77-08408) (Humphreys-ISWS)

MONITORING VEGETATION CONDITIONS FROM LANDSAT FOR USE IN RANGE FROM LANDSAT FOR USE IN RANG MANAGEMENT, Texas A and M Univ., College Station. R. H. Haas, D. W. Deering, J. W. Rouse, Jr., and

J. A. Schell.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 43-52, September 1975. 1 fig, 1 tab.

Descriptors: *Range management, *Remote sensing, *Vegetation, *Texas, *Great Plains, Monitoring, Growth stage, Forages, Plant growth, Analytical techniques, Mapping, Ranges, Satel-lites(Artificial), Statistics. Identifiers: LANDSAT.

A summary of the LANDSAT Great Plains Corridor projects and the principal results were presented. Emphasis was given to the use of satellite acquired phenological data for range management and agri-business activities. A convenient method of reducing LANDSAT MSS data to provide quantitative estimates of green biomass on rangelands in the Great Plains was explained. A Transformed Vegetation Index (TVI6), which is useful for detection and quantitative assessment of green biomass differences, was developed. Detailed statistical analysis showed that the T parameter, along with limited weather data, is adequate to quantatively assess rangeland feed accquate to quantatively assess rangeand reconditions. The ability to estimate green biomass in increments of 250 to 300 kg/ha with a 95% probability from TVI6 data and readily available weather data was indicated. (See also W77-08408) W77-08412

UTILIZATION OF LANDSAT IMAGERY FOR MAPPING VEGETATION ON THE MILLIONTH SCALE.

Kansas Univ., Lawrence, Space Technology

For primary bibliographic entry see Field 7C. W77-08413

ARE CLEAR-CUT AREAS ESTIMATED FROM LANDSAT IMAGERY RELIABLE,
Pacific Forest Research Centre, Victoria (British

Columbia). Y. J. Lee. In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session

Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 105-114, September 1975. 7 fig, 1 tab, 3 ref.

*Clear-cutting, *Lumbering. *Canada, *Remote sensing, Forest management Areal, Estimating, Data processing, Satel lites(Artificial), Mapping, Surveys. Identifiers: LANDSAT.

The reliability of LANDSAT imagery for estima-tion of clear-cut areas was evaluated by com-

parison with data obtained from high-altitude photos, logging historical maps, and from field inspections. A mature forest, owned by Pacific Logging Company, was selected as a test site because of its continuous clear-cut operation. The forest is about 50 km northwest of Victoria, British Columbia, Canada, and consists of 9092 ha. Ground truth was based on high-altitude photos and the Pacific Logging Company Logging History
Map for 1973, with a scale of 1:63,360. LANDSAT
imagery from band 5, recorded by multispectral
scanner, was obtained on September 4, 1972 and on August 12, 1973. Areas clear-cut within the past year were overestimated by 12.9% (105 ha), those clear-cut 1-year or more by 2.2% (76 ha), whereas uncut mature timber was underestimated by 3.6% (176 ha). Three clear-cut areas were missed in the company map and two in the LANDSAT enhancement. The difference between area estimates was significant when all 26 areas were included, but not when 2 overestimated areas were excluded from the analysis. The ability to identify the status and to estimate the size of current and past clearcutting activity has been definitely established. The acreages for clear-cut and uncut mature timber determined from LANDSAT imagery are reliable, and the LANDSAT color enhancement technique is a useful tool in up-dating clear-cut areas for long-term planning in forest manage-ment. (See also W77-08408) (Humphreys-ISWS) W77-08416

OPERATIONAL CONSIDERATIONS FOR THE APPLICATION OF REMOTELY SENSED FOREST DATA FROM LANDSAT OR OTHER AIRBORNE PLATFORMS,

Saint Regis Paper Co., Jacksonville, Fla. Southern Timberlands Div.

For primary bibliographic entry see Field 7C. W77-08417

TYPE SEPARABILITY SOUTHEASTERN UNITED STATES ON LAND-SAT-1 MSS DATA,

Lockheed Electronics Co., Inc. Houston, Tex. E. P. Kan, and R. D. Dillman.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 135-157, September 1975. 7 fig, 3 tab, 19 ref. NASA NAS 9-12200.

Descriptors: *Forest management, *Pulp and paper industry. *Remote sensing, *Southeast Descriptors: "Forest management, "Pulp and paper industry, "Remote sensing, "Southeast U.S., "Texas, Mapping, Lumber, Lumbering, Softwood, Hardwood, Classification, Data processing, Analytical techniques, Photogrammetry, Forestry, Forests, Land use, Industrial crops, Satellites(Artificial), Vegetation regrowth. Identifiers: LANDSAT.

A quantitative, computer-aided study was made on the spectral separability of timber types and condition classes in the Southeastern United States, using LANDSAT-1 multispectral scanner data. Conclusions were obtained on accuracies at different levels of mapping detail and the choice of parameters affecting mapping accuracies, such as spectral bands, number of bands, and seasons of data. It was concluded that LANDSAT-1 could be used effectively to discriminate the gross forest features of softwood, hardwood, and regenera-tion. The only significant detectable age difference would be between an established forest and a young (or denuded) forest, i.e., regeneration. The red or near infrared bands would be better for discrimination; phenological early and late spring data would be better than winter (summer and autumn data were not available for analysis). A temporal analysis would be superior to single-season analysis. Lastly, two spectral bands would be most cost effective for computer analysis. The study site, Sam Houston National Forest of East Texas, is a typical forest in the Flatwoods Zone, Southern

Region, U.S. Forest Service. The widely accepted computer scheme of training-field, maximum likelihood classifier was employed, while crossclassification accuracies and divergence measures were computed to evaluate timber type separabili-(See also W77-08408) (Humphreys-ISWS)

MAPPING OF THE WILDLAND FUEL CHARACTERISTICS OF THE SANTA MONICA MOUNTAINS OF SOUTHERN CALIFORNIA, Technology Applications.

For primary bibliographic entry see Field 7C. W77-08419

COMPUTER ANALYSIS AND MAPPING OF GYPSY MOTH DEFOLIATION LEVELS IN PENNSYLVANIA USING LANDSAT-1 DIGITAL DATA.

National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center. For primary bibliographic entry see Field 7C. W77-08420

COMPUTER IMPLEMENTED CLASSIFICA-TION OF VEGETATION USING AIRCRAFT ACQUIRED MULTISPECTRAL SCANNER DATA,

National Aeronautics and Space Administration, Bay Saint Louis, Miss. Earth Resources Lab. W. G. Cibula.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 183-201, September 1975. 11 fig, 3 tab, 8 ref.

Descriptors: *Forest management, Descriptors: "Forest management, "Remote sensing, "Mapping, "Mississippi, Aerial photography, Forests, Vegetation, Spatial distribution, Land use, Plant groupings, Classification, Trees, Canopy, Analytical techniques, Training.

The use of aircraft 24-channel multispectral scanner data in conjunction with computer processing techniques to obtain an automated classification of plant species associations was discussed. The classification of various plant spe-cies associations was related to information needed for specific applications. In addition, the necessity of multiple selection of training fields for a single class in situations where the study area consists of highly irregular terrain was detailed. It was mentioned that a single classification will be illuminated differently in different areas, resulting in the existence of multiple spectral signatures for a given class. These different signatures result because different qualities of radiation upwell to the detector from portions that have differing qualities of incident radiation. Techniques of training field selection were outlined, and a classificaing field scientification were outlined, and a Classifica-tion obtained from a natural area in Tishomingo State Park in north Mississippi was presented. (See also W77-08408) (Humphreys-ISWS) W77-08421

WILDLIFE MANAGEMENT BY HABITAT UNITS--A PRELIMINARY PLAN OF ACTION,

C. D. Frentress, and R. G. Frye. In: Proceedings of the NASA Earth Resources In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 245-262, September 1975. 4 fig, 34 ref, 2 append.

Descriptors: Wildlife habitats, *Remote sensing, *Texas, *Land use, Mapping, Vegetation, Trees, Classification, Management, Wildlife management, Environment, Maps, Spatial distribution, Oak trees, Juniper trees, Aerial photography, Satellites(Artificial), Analytical techniques. Identifiers: *Travis County(Tex), LANDSAT.

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Control Of Water On The Surface—Group 4A

The Texas Parks and Wildlife Department recognizes the need for managing populations of wildlife species by defined area units. A data stratification scheme is required to investigate species populations for the purpose of identifying unit boundaries. Vegetation type maps are commonly used to stratify data collection points and, subsequently to delineate boundaries of homogeneous populations. Procedures for yielding vegetation type maps were developed, using LANDSAT data and a computer assisted classification analysis (LARSYS) developed by Purdue University. Ground cover in Travis County, Texas, was classified on two occasions, using a modified version of the unsupervised approach to classification. The first classification produced a total of 17 classes. Examination revealed that further grouping was justified. A second analysis produced 10 classes which were displayed on printouts which were later colorcoded. The final classification was 82% accurate. While the classification map appeared to satisfactorily depict the existing vegetation, two classes were determined to contain significant error. A review of the procedures indicated that the major sources of error could have been eliminated by stratifying cluster sites more closely among previously mapped soil associations that are identified with particular plant associations. This could have served as a safeguard to prevent overlooking a vegetational class. (See also tions. This could have served as a safeguard to prevent overlooking a vegetational class. (See also W77-08408) (Humphreys-ISWS) W77-08426

THE RATIONALE FOR ATTEMPTING TO DEFINE SALT MARSH MOSQUITO-BREEDING AREAS IN GALVESTON COUNTY BY REMOTE SENSING THE ASSOCIATED VEGETATION.

Lockheed Electronics Co., Houston, Tex.

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G. R. Ap. In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 289-299, September 1975. 2 tab, 23 ref.

Descriptors: *Salt marshes, *Insect control, *Mosquitos, *Remote sensing, *Texas, Mapping, Environment, Grasses, Vegetation, Marsh plants, Aerial photography, Entomology, Surveys, Wetlands, Aquatic plants. Identifiers: *Galveston County(Tex).

This paper concerned the rationale for attempting to define salt marsh mosquito breeding areas in Galveston County, Texas. It concluded a botanical survey of the marsh plant communities, their relationship to flooding, and their exposure to salt water. Particular emphasis was given to Distichilis spicata, a widespread marsh grass. Evidence sug-gests that breeding areas of Aedes sollicitans, salt marsh mosquitos, are associated with Distichlis, and that both species respond to similar ecological conditions in the salt marsh. Analysis of the Galveston salt marsh community revealed five major plant associations, ranging from sea level to 91 cm (3 ft) in elevation. The associations are Spartina al-(310) in elevation. The associations are Spartina al-terniflora, Distichlis spicata, Spartina patens, salt flats, and Spartina spartinae. From aircraft over-flights at various altitudes, characteristics that identify Distichlis spicata and Spartina patens were defined. These characteristics may be used in identifying the associated mosquito-breeding areas either visually or by remote sensing, (See also W77-08408) (Humphreys-ISWS) W77-08428

A COMPARATIVE INTERREGIONAL ANALY-SIS OF SELECTED DATA FROM LANDSAT-1 AND EREP FOR THE INVENTORY AND MONI-TORING OF NATURAL ECOSYSTEMS, Earth Satellite Corp., Berkeley, Calif. For primary bibliographic entry see Field 7C. W77-08436

REMOTE SENSING APPLICATIONS IN KAN-

SAS, Kansas Univ., Lawrence. Space Technology

B. G. Barr, J. C. Coiner, and D. L. Williams.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agricultural-Environment, Volume L-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 569-584, September 1975. 8 fig, 7 ref. NASA NGL 17-004-024.

Descriptors: *Resources development, *Remote sensing, *Kansas, *Land development, Irrigation, Aerial photography, Project planning, Land use, Reservoirs, Highways, Satellites(Artificial), Planning, City planning, Cities, Urban mapping. Identifiers: LANDSAT.

The Satellite Applications Laboratory of the University of Kansas Space Technology Center has carried out since April 1972 a program designed to assist decision makers in local, state, and regional agencies in the application of remote sensing techniques to their activities. To date, twenty projects have been initiated in support of 29 separate municipal, county, regional, and state agencies or entities. Several data products have been prepared for the use of these agencies based on LANDSAT imagery: high altitude color, color infrared, and multispectral black and white photography; and imagery from a Hasselblad camera cluster flown in the University's aircraft. Projects organized in the six sequential phases of contact, project definition, project initiation, on-going project, project completion, and continuing support were designed to demonstrate the utility of remote sensing in the context of the user agency. After reviewing these phases, four projects were detailed to illustrate the methods and results of applications projects. Two of these projects have resulted in single user decisions during 1974 related to: (1) completion of an interstate highway and cancellation of construction plans for a large reservoir, and (2) zoning changes around a smaller reservoir. Two on-going projects were also discussed: (1) a multi-user project related to the expansion of irrigation in Kansas, and (2) a program of activities leading to incorporation of remote sensing into the data acquisition methods of Kansas City, Kansas. (See also W77-08408) (Humphreys-ISWS) W77-08437

SELECTIVE WITHDRAWAL AND HEATED WATER DISCHARGE: INFLUENCE ON THE WATER QUALITY OF LAKES AND RESERVOIRS PART I - SELECTIVE WITHDRAWAL, Wisconsin Univ. - Madison. Dept. of Civil and Environmental Environment vironmental Engineering. For primary bibliographic entry see Field 5G. W77-08447

A FINITE ELEMENT MODEL TO DETERMINE THE EFFECT OF LAND-USE CHANGES ON FLOOD HYDROGRAPHS, Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering. For primary bibliographic entry see Field 8B. W77-08450

RECLAMATION AND USE OF DISTURBED LAND IN THE SOUTHWEST.
For primary bibliographic entry see Field 5G. W77-08452

DETERMINATION OF WATER-RESOURCES POLICIES IN ARID LANDS, For primary bibliographic entry see Field 6B. W77-08453

DRAINABLE POROSITY EVALUATION AND ITS RELATIONSHIP TO HYDRAULIC CONDUCTIVITY AND EXCHANGEABLE CATIONS UNDER DIFFERENT BULK DENSITIES, Alexandria Univ. (Egypt). Dept. of Soil and Water

M. I. Fahmy, M. El-Said, and Y. Z. El-Shafei. Alexandria Journal of Agricultural Research, Vol. 23, No. 1, p 183-197, April, 1975. 8 fig, 2 tab, 16

Descriptors: *Moisture tension, *Hydraulic conductivity, *Porosity, *Drainage, *Bulk density, Conductivity, Cations, Density, Physical properties, Soil types, Sands, Clays, Saline soils, Salinity, Clay loam. Identifiers: *Drainage porosity, Egypt.

Drainage is an important practice for normal agriculture and for reclaiming saline soils. A study was conducted to find a feasible method for was conducted to find a feasible method for evaluating drainable porosity by implementing the moisture-tension curve of soil, and to investigate its relationship to hydraulic conductivity, bulk density and exchangeable cations of different soils of Egypt. A clay soil, a calcareous soil, and sandy soil from different regions in Egypt were planted in corn and cotton and measurements taken. The in corn and cotton and measurements taken. The results are presented. The relationship between drainable porosity and hydraulic conductivity showed an exponential proportionality for the disturbed calcareous and sandy soils. It has been found that drainage porosity should be maintained at higher than ten percent to yield high production. Compaction reduced both values of drainable porosity and hydraulic conductivity for either disturbed or undisturbed sample. (Jamail-Arizona). Arizona). W77-08461

COMPUTER PROGRAM FOR RESERVOIR-WATER BUDGETS,

Agricultural Research Service, Chickasha Okla. Southern Great Plains Watershed Research

R. R. Schoof. USDA Publication No. ARS-S-161, April 1977. 32 p, 6 fig, 3 tab, 8 append.

Descriptors: *Runoff, *Reservoirs, *Flow control, *Computer programs, Discharge(Water), Base flow, Evapotranspiration, Hydrology, Seepage, Spillways, Dam, Inflow, Water storage, *Hydrologic budget. Identifiers: Floodwater-retarding reservoirs, Reservoir water budget, FORTRAN IV.

A computer program for computing reservoir-water budgets is presented. The program was designed for floodeater-retarding reservoirs, whe the system is applicable to all water-storage reser-voirs where there is a need for computation and voirs where there is a need for computation and tabulation of water input, output, and change in storage. Discussions of the computing procedure, input and output formats, and data-editing routine are included. Flow charts of the main program and two of the subroutines, complete FORTRAN listings, and symbol definitions are also included. (ARS).

W77-08464

WATER-RESOURCES INVESTIGATIONS IN SOUTH DAKOTA, 1976.
Geological Survey, Huron, S.D. Water Resources

For primary bibliographic entry see Field 7C. W77-08468

FLOODS OF NOVEMBER 12, 1974, IN THE CHARLOTTE AMALIE AREA, ST. THOMAS, U.S. VIRGIN ISLANDS, Geological Survey, Miami, Fla. Water Resources Div.; and Geological Survey, San Juan (Puerto Rico). Water Resources Div. For primary bibliographic entry see Field 7C.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

W77-08470

TIME OF TRAVEL OF SOLUTES IN THE EAST FORK TRINITY RIVER, NOVEMBER 1975; AND ELM FORK TRINITY RIVER, DECEMBER 1975; TRINITY RIVER BASIN,

Geological Survey, Fort Worth, Tex. Water Resources Div.
For primary bibliographic entry see Field 7C.

HYDROLOGIC UNIT MAP--1974, STATE OF

Geological Survey, Reston, Va. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-08474

HYDROLOGIC UNIT MAP--1974, STATE OF

Geological Survey, Reston, Va. Water Resources Div.

For primary bibliographic entry see Field 7C.

W77-08475

HYDROLOGIC UNIT MAP--1974, STATE OF SOUTH DAKOTA.

Geological Survey, Reston, Va. Water Resources

For primary bibliographic entry see Field 7C.

W77-08476

HYDROLOGIC UNIT MAP-1974, STATE OF

Geological Survey, Reston, Va. Water Resources

For primary bibliographic entry see Field 7C.

W77-08477

ACTIVITIES OF THE WATER RESOURCES DIVISION IN CALIFORNIA.

Geological Survey, Menlo Park, Calif. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-08479

WATER RESOURCES DATA FOR CONNEC-

TICUT, WATER YEAR 1975, Geological Survey, Hartford, Conn. Water Resources Div.
For primary bibliographic entry see Field 7C.

W77-08480

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1975.

Geological Survey, Albany, N.Y. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-08485

PREDICTION MODELS OF REAERATION

RATE FOR MOUNTAIN CREEKS, Utah State Univ. Dept. of Civil and Environmental

Engineering. For primary bibliographic entry see Field 5G. W77-08501

FOREST FERTILIZATION AND WATER QUALITY IN THE NORTH CAROLINA PIED-

MONT, North Carolina State Univ., Raleigh. School of Forest Resources. For primary bibliographic entry see Field 5B. W77-08508

FRACTIONATION AND CONTROL OF IRON IN CHANNELIZED AND SWAMP DRAINAGE STREAMS IN NORTH CAROLINA, East Carolina Univ., Greenville, N.C. Dept. of

Biology. For primary bibliographic entry see Field 5B. W77-08510

DESIGN AND OPERATION OF RAIN RETEN-TION BASINS (ENTWURF UND BETRIEB VON REGENRUCKHALTEBECKEN), For primary bibliographic entry see Field 8A.

W77-08547

4B. Groundwater Management

DEEP WATER RESOURCES LIMESTONES OF FRANCE LIMESTONES OF FRANCHE-COMTE: PROBLEMS OF QUANTITY AND QUALITY, (IN FRENCH), M. Dreyfuss.

Ann Sci Univ Besancon Geol. 18, p87-95, 1973.

Descriptors: Water quality, *Limestone, Ground-water, *Water pollution sources, *Groundwater resources, Water sources, Water supply, *Chemical compounds.

Identifiers: *France(Franche-Comte).

There are large reserves of deep water in the limestones of Franche-Domte, France, of the order of several billion m3 or a volume about order of several binion ms or a volume about equivalent to that yielded by the rivers yearly, but the exploitation of these reserves presents several difficulties. Bores placed haphazardly in a favora-ble zone but not reaching a subterraneous circula-tion yield a limited output. As to quality, the water contains many stable soluble chemical compounds which may at times be dangerous. The plateaux and mountains above these water sources are in-habited; there are agricultural enterprises, indus-try and tourism. The zones of access by possibly polluted water additions must be avoided, and the quality of the water for human consumption must be carefully studied .-- Copyright 1975, Biological Abstracts, Inc. W77-08122

WELLS, PUMPING PLANTS, CONDUITS AND

For primary bibliographic entry see Field 6E. W77-08154

WATER RESOURCES DATA FOR INDIANA,

WATER YEAR 1975, Geological Survey, Indianapolis, Ind. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-08162

SELECTED WATER-LEVEL RECORDS FOR WESTERN OKLAHOMA, 1950-1975, Geological Survey, Oklahoma City, Okla. Water

Resources Div. For primary bibliographic entry see Field 7C. W77-08163

GROUND-WATER DATA FOR 1974-75 IN JOSHUA TREE NATIONAL MONUMENT,

Geological Survey, Menlo Park, calif. Water For primary bibliographic entry see Field 7C. W77-08164 Resources Div.

SUBSURFACE-TEMPERATURE DATA FOR SOME WELLS IN WESTERN UTAH, Geological Survey, Salt Lake City, Utah. Water

Resources Div. For primary bibliographic entry see Field 7C. W77-08166 WATER RESOURCES OF THE MYAKKA RIVER BASIN AREA, SOUTHWEST FLORIDA, Geological Survey, Tallahassee, Fla. Water Geological Survey, Resources Div.

B. F. Joyner, and H. Sutcliffe, Jr.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 768, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 76-58, December 1976, 87 p. 18 fig. 7 tab. 38 ref.

Descriptors: *Groundwater resources, *Surface waters, *Water quality, *Florida, Aquifer characwaters, "Water duality, "Florida, Aquirer charac-teristics, Water table aquifers, Artesian aquifers, Water wells, Water yield, Water supply, Chemical analysis, Groundwater movement, Surface-groundwater relationships, Streamflow, Lakes. Identifiers: "Myakka River basin(Fla).

Ground water in the Myakka River basin area of southwest Floria is obtained from a water-table aquifer and from five zones in an artesian aquifer.
Wells in the water-table aquifer yield generally less than 50 gpm and dissolved solids concentration in the state of the s tion is less than 500 mg/liter except in coastal areas and the peninsula southwest of the Myakka River estuary. Wells in the Venice area that tap zone 1 usually yield less than 30 gmp. The quality of water is good except in the peninsula area. Zone 2 is the most highly developed aquifer in the heavily populated coastal areas. Wells yield as much as 200 gpm. In most areas, water is of acceptable quality. Wells that tap zone 3 yield as much as 500 gmp. Fluoride concentration ranges from 1 to 3.5 mg/liter. Zone 4 yields as much as 1,500 gpm to large diameter wells. Except in the extreme northeastern part of the area water from zone 4 usually contains high concentrations of fluoride and sulfate. Zone 5 is the most productive aquifer in the area, but dissolved solids concentrations usually are too high for public supply except in the extreme northeast. Surface water derived from natural drainage is of good quality except for occasional high color in summer. Most of the streams in the Myakka River basin area have small drainage basins, are of short channel length, and do not yield high volumes of flow. During the dry season, streamflow is maintained by groundwater discharge, and, as a result, chloride, sulfate, and dissolved solids concentrations and the hardness of the water are above drinking water standards for some streams. (Woodard-USGS) W77-08167

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S GEOLOGICAL SURVEY. RESOURCES DIVISION, RADIOCARBON MEA-SUREMENTS I,

Geological Survey, Reston, Va. Water Resources

F. J. Pearson, Jr., and M. Bodden. Radiocarbon, Vol 17, No 1, p 135-148, 1975. 5 tab,

31 ref. Descriptors: *Radioactive dating, *Groundwater,

**Carbon radioisotopes, Analytical techniques, Sampling, Washington, Nevada, California, Ar-kansas, Texas, Africa. Identifiers: **Kenya.

Results of C-14 analyses of dissolved carbonate from 121 water samples are reported. Hydrologic systems from which results from 10 or more wells are given include, Pasco Basin, south-central washington; Southern Great Basin, Nouth-central Washington; Southern Great Basin, Nevada and California; Arkansas Hot Springs; Edwards Aquifer, Texas; and North Eastern Province, Kenya. (Woodard-USGS)
W77-08169

GROUND-WATER RESOURCES OF VAN-

GROUND-WATER RESOURCES OF VAN-DERBURGH COUNTY, INDIANA, Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, St. Paul, Minn. Water Resources Div. L. W. Cable, and R. J. Wolf.

Indiana Department of Natural Resources, Indianapolis, Bulletin No 38 of the Division of Water, 1977, 37 p, 19 fig, 3 plates, 3 tab, 17 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Aquifer characteristics, *Water quality, *Indiana, Hydrologic data, Hydrogeology, Water yield, Transmissivity, Geophysics, Maps, Groundwater discharge, Water analysis, Chemical analysis.

Identifiers: Vanderburgh County(Ind).

Sandstone units of Middle and Late Pennsylvanian age and sand and gravel of Quaternary age are the source of fresh (1,000 parts per million of dissolved solids or less) ground water in Vanderburgh County, Indiana. Aquifers occur in older rocks, but, owing to their depth, the water is too highly mineralized to be useful for most purposes. Sand and gravel deposits of the Ohio River Valley are the best aquifer in Vanderburgh County. These deposits form a single hydrologic unit referred to as the Ohio River valley aquifer. This is the only aquifer in the county capable of accommodating high-yield wells. Properly constructed wells in this aquifer could easily yield 1,000 gallons per minute and more. Transmissibilities in the Ohio River valley aquifer range from 120,000 gallons per day per foot and less near the valley walls to more than 200,000 gallons per day per foot in the thickest parts of the aquifer. The water in the aquifer is predominately a very hard calcium bicarbonate type having a high iron content. (Woodard-USGS) W77-08170

GROUND WATER IN THE SAN JUAN METROPOLITAN AREA, PUERTO RICO, Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div. H. R. Anderson.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 414/AS, Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 41-75, July 1976. 34 p. 15 fig, 3 tab, 24 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *Puerto Rico, Water wells, Water supply, Water utilization, Surface-groundwater relationships. Identifiers: *San Juan area(PR).

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Ground water in the San Juan, Puerto Rico, area has played a declining role in water supply since the completion of the Lofza reservoir project in the early 1950's. Ground-water potential is limited because of the small size of the aquifers and susceptibility to seawater intrusion. Of the 30 million gallons per day about half is being used. Two water-bearing zones are present: an artesian aquifer, composed of the San Sebastian Formation and the lower Cibao Formation that yields an average of 244 gallons per minute to wells; and, a water-table aquifer composed of the upper Cibao Formation and the Aguada and Aymamon Limestones that yields an average of 515 gallons per minute to wells. Ground water is less mineralized inland and in the artesian aquifer. Mean concentrations of dissolved solids are 363 milligrams per liter for the artesian aquifer and 525 milligrams per liter for the water-table aquifer. (Woodard-USGS)

GEOHYDROLOGY OF THE ENGLISHTOWN FORMATION IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY, Geological Survey, Trenton, N.J. Water Resources Div.

For primary bibliographic entry see Field 2F.

GEOHYDROLOGY OF THE ALBIN AND LA GRANGE AREAS, SOUTHEASTERN WYOM-ING, Geological Survey, Cheyenne, Wyo. Water

Resources Div. W. B. Borchert.

Water-Resources Investigations 76-118 (Open-File Report), November 1976. 72 p, 20 fig, 4 tab, 27 ref.

Descriptors: *Aquifer characteristics, *Water level fluctuations, *Irrigation wells, *Observation wells, *Pumping, Drawdown, Groundwater recharge, Hydrogeology, Well data, Borehole geophysics, Surface-groundwater relationships, Groundwater movement, Water quality, Chemical analysis, Subsurface mapping, *Wyoming. Identifiers: Southeastern Wyoming.

The Albin and La Grange areas in southeastern Wyoming are two adjoining different hydrologic areas. Since ground water is the only source of water for irrigation in the Albin area, 34 irrigation wells have been drilled since 1968 and developed in conjunction mostly with center-pivot sprinkler systems that in 1974 irrigated about 6,980 acres. Most irrigation wells are developed in channel deposits of the Ogallala Formation of late Miocene. Water levels in parts of these channel deposits have declined about 4 to 7 feet since pumping began in 1968. In the La Grange area, lands are irrigated by surface water, ground water or a combination of both. The best producing wells are those completed in both the Brule Formation of Oligocene age and the alluvium. Secondary porosity was located and elevated in the Brule using caliper logs, an Acoustic Borehole Televiewer and geophysical logs. From the spring of 1970 to the spring of 1974, hydrographs of wells in parts of the La Grange area show water-level es of about 5 feet resulting from the net effect of surface-water recharge and groundwater pump-age. Throughout the La Grange area no significant annual water-table declines have occurred. It is unlikely that irrigation wells pumping near Horse Creek have caused significant direct streamflow depletion. (Woodard-USGS)

GROUND-WATER BASIC DATA FOR RAMSEY COUNTY, NORTH DAKOTA, Geological Survey, Bismarck, N. Dak. Water Resources Div. For primary bibliographic entry see Field 7C.

W77-08177

HYDROLOGIC EFFECTS OF THE TAMPA BYPASS CANAL SYSTEM, Geological Survey, Tallahassee, Fla. Water Resources Div. For primary bibliographic entry see Field 4A. W77-08182

SELECTED HYDROLOGIC DATA, UINTA BASIN AREA, UTAH AND COLORADO, Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 7C. W77-08187

WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1975, Geological Survey, Champaign, Ill. Water Resources Div. For primary bibliographic entry see Field 7C. W77-08184

WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1975, Geological Survey, Carson City. Nev. Water Resources Div. For primary bibliographic entry see Field 7C. W77-08185

EFFECT OF DIP ON THE SUBSURFACE STORAGE OR DISPOSAL OF FLUID IN SALINE AQUIFERS, Louisiana Water Resources Research Inst., Baton Rouge.

J. A. D'Amico.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267747,

J. A. D'Amico.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267747, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, August 1975. 103 p, 15 fig, 8 tab, 21 ref, 4 append. OWRT A-034-LA(2).

Descriptors: *Groundwater, *Water storage, Hydraulics, Water supply, Groundwater recharge, Injection wells, Recharge wells, Artificial recharge, Aquifers, Disposal, Computer programs. Identifiers: *Saline aquifers, *Underground storage, *Dipping system(Wells).

Previous investigators have established the feasibility of utilizing horizontal saline aquifers focyclic storage of fresh water and have shown that the recovery efficiency in a dipping system is lower than in a similar horizontal system. The present study was made to determine the effect of dip on the configuration, migration, and recovery of a 'bubble' of injected fresh water in a dipping aquifer of infinite areal extent utilizing a three-dimensionl rectangular miniaquifer. Experimental results showed that the lower surface of the injected bubble would not migrate and would remain radial. However, the upper surface would slide updip for all cases investigated. Dip angles ranged from 5-20 degrees. With increasing dip angle and injected bubble size the velocity of the upper surface entereased, although the lower surface method and injected form from a constant multiplied by the sine of the dip angle. An existing computer program was adapted to describe the three-dimensional case. The results are applicable to miscible displacement processes wherever a density difference exists between native and injected fluids in a dipping aquifer. Subsurface dieposal of water-soluble wastes and enhanced dieposal of particular in the periodeum industry are two such examples outside the field of subsurface storage of fresh water.

EFFECT OF VISCOSITY RATIO ON THE RECOVERY OF FRESH WATER STORED IN SALINE AQUIFERS, Louisiana State Univ., Baton Rouge. Dept. of

Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering. B. K. Agrawal.

D. N. Agrawai.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 746, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, December 1975. 80 p, 15 fig, 6 tab, 26 ref, 3 append. OWRT(3) A-034-LA.

Descriptors: *Groundwater, *Water storage, Hydraulics, Water supply, Groundwater recharge, Injection wells, Recharge wells, Artificial recharge, Aquifers, *Viscosity, Computer programs.

Identifiers: *Saline aquifers, Underground storage.

Previous studies have shown the technical feasibility of storing fresh water in saline aquifers where the viscosities of injected and native fluids are essentially identical. This study was on the effect of viscosity difference on the extent of mixing between injected and native fluids in two artificially consolidated sandstones of differing thicknesses. When a lower viscosity fluid miscibly displaces a higher velocity fluid, it tends to finger into the higher viscosity fluid region. This causes an irregular boundary and larger interface between the two, with increased mixing. In a cyclic operation of injection/storage/production of a less viscous fluid, fingers during injection were found

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

to retrace themselves during production. During a cyclic process the amount of mixing which occurs may be described in terms of an effective dispersivity which is a function of viscosity ratio. This coefficient may be used in existing computer proams to predict the portion of uncontaminated injected fluid to be later recovered. This recovery efficiency is approximately the same no matter which fluid is the more viscous. The effective dispersivity may be used together with the arithmetic average viscosity to predict the performance of a cyclic process in which the fluids differ in density and viscosity. The results of this study are particularly applicable to the un-derground storage of heat in the form of hot water. W77-08205

DIAGENESIS OF MIDDLE AND UPPER CARBONATE SHORELINE FOCENE SEQUENCES, CENTRAL FLORIDA.
Florida Univ., Gainesville. Dept. of Geology For primary bibliographic entry see Field 2F. W77-08208

MINIMIZING COSTS IN WELL FIELD DESIGN IN RELATION TO AQUIFER MODELS, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. A. Bostock, E. S. Simpson, and T. G. Roefs.
Water Resources Research, Vol. 13, No. 2, p 420-426, April 1977. 4 fig, 8 ref. OWRT A-024-ARIZ(10).

Descriptors: *Wells, *Costs, *Optimization, *Economic efficiency, Probability, Demand, Pumping, *Aquifers, Annual, Water table, Methodology, Decision making, Seasonal, Groundwater, Mathematical models, Operations research.

Identifiers: *Cost minimization, *Well fields, Probability density function.

For a given production rate from a proposed well field, well construction and replacement costs decrease with fewer and larger wells spaced farther apart, while pumping lift costs increase. A method for minimizing the sum of these two costs is presented which uses a two-dimensional uniform grid of wells to select a combination of well spacing and well capacity that minimizes costs for a given demand. Uncertainty in field permeability at future well sites is treated by averaging the possible outcomes over all wells in accord with a probability density function for permeability values. The method assumes an annual cycle whereby the water table declines owing to pumping in a dry season and is recharged to its initial state during a wet season. It is concluded that the method is suited by Bayesian decision theory application and that it is independent of the mathematical theory for groundwater flow used to redict aquifer response in the aquifer cell model. (Bell-Cornell) W77-08214

APPLICATIONS OF SURFACE RESISTIVITY METHODS,

Alberta Univ., Edmonton. Dept. of Geolog For primary bibliographic entry see Field 2F. W77-08244

EFFECT OF DIP ON THE STORAGE OF FRESH WATER (OR THE DISPOSAL OF WASTE) IN A SALINE AQUIFER,

Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 915, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, May 1976. 76 p. 9 fig, 5 tab, 30 ref, 2 append. OWRT A-034-LA(4).

Groundwater, *Water storage, Descriptors: Hydraulics, Water supply, "Groundwater recharge, "Injection wells, Recharge wells, Artificial recharge, Aquifers, Waste water disposal, "Groundwater movement. Identifiers: Saline aquifers, *Dip angle(Aquifers).

The economic and technical feasibility of storing resh water in a saline aquifer has been studied by numerous investigators. Computational procedures exist for predicting the recovery efficiency in a homogeneous, horizontal, isotropic aquifer of infinite aeral extent. This work studied the migration and recovery efficiency of a stored bubble of fluid in a non-horizontal aquifer. The experiments consisted of injecting a fluid of equal viscosity but greater density than the native fluid into an inclined synthetic sandstone miniaquifer. The fluid was injected, allowed to undergo a period of static storage, and then produced. The instantaneous composition of the produced stream was monitored to determine when the concentra-tion of native fluid reached 3% (breakthrough). During static storage the frontal positions of both the upper and lower traces were recorded. The recovery efficiency was lower in a dipping aquifer than in ahorizontal aquifer. The recovery efficiency became less with greater dip angles and longer static storage times. The larger bottom trace of the injected bubble migrated downdip and its diameter increased during static storage. The velocity of migration of the larger trace could be measured and approximated by an equation, while for most experimental runs the movement of the smaller trace was indeterminate. Results of this study are applicable to fresh water storage or waste disposal as well as other miscible displacements in inclined aquifers. W77-08288

WATER-LEVEL DECLINE AND PUMPAGE IN DEEP WELLS IN THE CHICAGO REGION.

Illinois State Water Survey, Urbana For primary bibliographic entry see Field 2F. W77-08302

AN INVESTIGATION OF THE TECHNICAL AND ECONOMIC FEASIBILITY OF USING LOW TEMPERATURE GEOTHERMAL SOURCES IN COLORADO,

Environmental Consulting Services. Boulder, Colo.

Bounder, Colo. L. W. Nannen, F. Kreith, and R. E. West. Energy, Vol. 1, No. 2, p 179-216, March, 1977. 9 fig, 12 tab, 31 ref, 3 append.

Descriptors: *Colorado, *Economic feasibility, *Thermal water, *Heating, *Geothermal studies, Hot springs, Fuels, Piping systems(Mechanical), Wells, Heat transfer, Injection wells, Waste water disposal, Corrosion, Corrosion control, Scaling, Computer models, Public rights, Public utilities, Political aspects, Economic impact, *Feasibility

Identifiers: *Glenwood Springs(Colo), *Low-temperature geothermal sources, Fuel consumption data, Geothermal space heating system design, Heat exchangers, Downhole heat exchangers, Public opinion surveys.

All the technology necessary to use low temperature geothermal sources for heating homes and buildings now exists, has been put into use in vari-ous places throughout the world, and is dependent basically only on economic and political decisions for its application in areas where thermal water is present. This report contains results of the first phase of an engineering/economic feasibility study for use of low temperature geothermal sources at Glenwood Springs, Colorado. Conversion costs of building systems, transport distance of geothermal water, and quality of the water still require further study, but it can be concluded that geothermal heat could be delivered to the area for \$2 to \$5 per million BTU, a price competitive with that of natu-

ral gas heating should the latter continue to escalate. It would be considerably less expensive than solar conversion at present. Besides providing a historical overview of low temperature geothermal resource development worldwide, the report raises legal and political issues pertinent to new, raises legal and political issues perminent to new, widespread use of geothermal water, discusses implicatons for public policy and population dynamics, and lists potential engineering problems such as scaling, corrosion and general system maintenance. (Eberle-NWWA)

100 MESH SAND IMPROVES HYDRAULIC FRAC RESULTS World Oil, Vol. 184, No. 6, p 44 May, 1977, 1 ref.

Descriptors: *Fractures(Geology), *Water wells, *Water yield improvement, Specific capacity, Rehabilitation, Sands, Oil wells, Carbonate rocks. Identifiers: *Hydraulic fracturing.

While drilling operators for some time have been using small diameter, 100 mesh sand as a method of controlling fluid loss in high volume acid or hydraulic fracturing treatments of wells, principal enefits and application procedures are not very widely known. Penetrating of acid and fracturing jobs in carbonates often falls short of expectations due to hairline fractures in the formation which steal the working fluid and limit the extension of the main fracture from the well bore. Once the 100 mesh sand is introduced, however, normal fluid loss additives are able to bridge the sand pack in the hairline fracture and the desired effects are obtained. The sand which remains in the fractures at the completion of the treatment forms a highly permeable channel for ground water and helps to prevent fractures from closing naturally. (Eberle-W77-08312

WATER SUPPLY AND CONTROL DEVELOP-MENTS SUMMARIZED, (ARIZONA). For primary bibliographic entry see Field 6E. W77-08313

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THE ERDA GEOTHERMAL PROGRAM, Energy Research and Development Administra-tion, Washington, D.C. R. S. H. Toms.

IEEE Transactions on Nuclear Science, Vol. NS-24, No. 1, p 29-32, February, 1977. 2 ref.

Descriptors: *Thermal power, *Government supports, *Research and development, Federal project policy, Project planning, Cost sharing, *Geothermal studies, Electric power production. Identifiers: Resource exploration and assessment, Progressing research *Geothermal area. *Geothermal Engineering gram(ERDA). research.

In order to help provide viable options to exploit America's geothermal resouces, ERDA is taking a America's geothermal resouces, ERDA is taking a lead in research and development by investigating ways to assess existing geothermal reservoirs and their energy potential, encouraging the present geothermal industry to continue development, and directly assisting in devising new technologies for utilizing more inaccessible sources. Besides the geological and technological impediments to rapid geothermal resource development, legal and regulatory problems related to geothermal mining need to be worked out, and utility companies must be convinced to take moderate risks in implementing convinced to take moderate risks in implementing new procedures. ERDA hopes to discover solutions by concentrating its geothermal program on four major areas: (1) a loan guaranty program, (2) construction and operation of pilot plants, costshared with industry in most cases, (3) monies for advanced technology research, and (4) support for environmental and institutional studies. A new form of solicitation known as a Program Research and Development Announcement has led to the negotiation of a good many new contracts with the

ERDA Geothermal Division. A new and more generous agency patent policy is also expected to facilitate cooperation between ERDA and the private sector. (Eberle-NWWA) W77-08314

AQUIFER MODELING HELPS FARMERS. For primary bibliographic entry see Field 2F. W77-08317

TRUE-TEMPERATURE DETERMINATION OF GEOTHERMAL RESERVOIRS, Texas Instruments, Inc., Dallas, Tex. For primary bibliographic entry see Field 7B.

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DEEP WELLS FOR DEWATERING OFFER REAL ADVANTAGES, PART II, Johnson Driller's Journal, Vol. 49, No. 2, p 1-3, March-April, 1977, 6 fig. 3 ref.

Descriptors: *Dewatering, *Deep wells, *Excavation, Water table, Pumping, Well screens, Observation wells, Foundations, Minnesota, Georgia.

Identifiers: Prairie Island Nuc Plant(Minnesota), Fort Gaines Dam(Georgia).

Because of the design of dewatering wells is such that maximum drawdown with minimum yield are realized, design considerations such as pump placement must reflect this intent. Also, it should be noted that because of special atmospheric and be noted that because of special atmospheric and head conditions in dewatering situations, observation wells cannot be reliably used to determine the actual water level in the aquifer. Two specific cases serve as examples of creative, efficient use of deep wells for dewatering. The Prairie Island Nuclear Plant near Red Wing, Minnesota was constructed over a thick water-table aquifer composed of alluvial sand and gravel; excavation specifications called for dewatering to 32 feet below static level. A total of 39 deep wells completed by natural development lowered the water levels to the desired elevation 20 days abeed water levels to the desired elevation 20 days ahead of schedule. In a similar manner 24 deep wells de-watered a limestone aguifer and controlled artewatered a interestoric adulter and controlled after-sian head to permit construction of the spillway of the Ft. Gaines, Georgia dam. (See also W77-07294) (Eberle-NWWA)

GROUND WATER RECHARGE IN EASTERN CONNECTICUT BASED ON SIMULATION MODELING,

Connecticut Univ., Storrs. For primary bibliographic entry see Field 2F. W77-08344

A PRELIMINARY ANALYSIS OF THE ENERGY AND WATER REQUIREMENTS FOR DEVELOPING GEOTHERMAL ENERGY IN

ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
D. Norton, and T. Gerlach.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 047, Price codes: A02 in paper copy, A01 in microfiche.
In: Proceedings, Conference on Water Requirements for Lower Colorado River Basin Energy Needs, The University of Arizona, Tucson, Arizona, May 8-9, 1975. p 107-121, 4 fig, 1 tab, 3 ref. OWRT A-054-ARIZ(1). 14-31-0001-5003.

Descriptors: *Geothermal studies, *Thermal water, Heat flow, Hydrologic data, *Energy, *Water requirements, *Arizona.

Production of energy from geothermal fluids is an attractive alternative for many reasons. Geothermal energy, unlike most other energy alternatives, does not require extensive mining, refinement, packaging, transportation, or surface storage of

fuel. Major quantities of energy and water input are required to develop energy resources. If the energy inputs are based on current technology, fossil fuels are implicitly required for a large percentage of this input. Geothermal energy based power systems have two distinct advantages: (1) Resource development and delivery to the plant site consume small amounts of energy and (2) the recovery of the resource has a minor impact on man's environment. The estimated overall energy efficiency of a 2000MW geothermal power system in Arizona is approximately 1200MW must be consumed). This means that 80-50% of the total energy recovered from a geothermal system is required for exploration, development, power plant construction, and environmental protection. A 2000MW geothermal energy development would require at least 250 exploration wells drilled to a similar depth for actual development and recovery of subsurface thermal water. Only a similar depth for actual development and recovery of subsurface thermal water. Only 150 of the 300 wells would be used. face thermal water. Only 150 of the 300 wells would be producers—the remainder could be used for recharge. The energy consumed in this opera-tion relates directly to drilling equipment and materials. This work requires fossil fuel type energy support under today's technology. The total energy requirement for both phases is 5×10 to the thirteenth power kcal, equivalent to 3.4×10 to the seventh power BBLS of crude oil. (See also W76-04005) W77-08351

ARTESIAN WELLS.

For primary bibliographic entry see Field 6E. W77-08397

GROUNDWATER RESOURCES OF GUAM: OC-CURRENCE AND DEVELOPMENT, Guam Univ., Agana. Water Resources Research

J. F. Mink.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-268 236, Price codes: A13 in paper copy, A01 in microfiche. Technical Report No. 1, September 1976, 276 p, 24 fig, 17 tab, 32 ref, 4 maps, 2 append. OWRT A-001 GUAM(1), 14-31-0001-5054.

Descriptors: *Groundwater resources, Limestones, Groundwater movement, Monitoring, *Aquifers, *Hydrogeology, History, *Geochemistry, Waste disposal, Storm water, Water yield, *Water wells, *Water pollution. Identifiers: *Groundwater resources(Guam),

A historical account of the development of A historical account of the development of Guam's groundwater resources is given. Guam's hydrogeology is discussed and groundwater areas are indicated, distinctions being made between basal water areas, para-basal water areas, and perched water areas. Based on available data, a study is made of the geochemistry of Guam's groundwater resources. The groundwater pollution potential of different methods of surface and water for water and storm water is subsurface disposal of waste and storm water is discusses. Of special significance are calculations of the sustainable yield of the basal lens of northern Guam along with recommendations for further development of groundwater resources. Finally, recommendations are made concerning desirable locations for monitoring wells. (Winter-Guam) W77-08448

BACTERIOLOGICAL POLLUTION IN THE DRINKING-WATER OF JORDAN, Ministry of Health, Amman (Jordan). Dept. of Bacteriology. For primary bibliographic entry see Field 5B. W77-08454

HISTORIC WATER-LEVEL CHANGES AND PUMPAGE FROM THE PRINCIPAL AQUIFERS OF THE MEMPHIS AREA, TENNESSEE: 1886-

1975, Geological Survey, Memphis, Tenn. Water

Geological Survey, Memphis, Tenn. Water Resources Div. J. H. Criber, and W. W. Parks. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-264 778, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-67, May 1976. 45 p, 10 fig, 6 tab, 21 ref.

Descriptors: *Groundwater resources, *Pumping, *Water level fluctuations, *Aquifer characteristics, *Water utilization, *Tennessee, Withdrawal, Hydrogeology, Water wells, Potentiometric level, Water supply.

Identifiers: *Memphis area(Tenn), Groundwater

Annual pumpage in the Memphis, Tennessee area, for both the Memphis Sand ('500-foot' sand) and Fort Pillow Sand ('1400-foot' sand) from the time Fort Pillow Sand ('1400-foot' sand) from the time of initial pumping from these aquifers to 1975 is presented in both tabular and graphic forms. The Memphis Sand supplied 188 million gallons per day in 1975 or 95 percent of the total water used in the area. Pumpage from the Fort Pillow Sand has decreased in recent years and in 1975 was about 4 million gallons per day. Pumping increases from the Memphis Sand have caused an almost continual decline of water levels. Water-level-change may show the fluctuations in water levels for two tinual decline of water levels. Water-level-change may show the fluctuations in water levels for two periods of high water use. Water levels in the Fort Pillow Sand show a rise since 1963, coincidental with pumping reductions. The data suggest that a constant pumping rate will cause little water-level decline and that the water levels can be altered for efficient resource management by areally varying the distribution of pumping. (Woodard-USGS)

MAPS SHOWING GROUND-WATER CONDI-TIONS IN THE PUERCO-ZUNI AREA, APACHE AND NAVAJO COUNTIES, ARIZONA-1975, Geological Survey, Flagstaff, Ariz. Water

Resources Div. For primary bibliographic entry see Field 7C. W77-08471

DIGITAL-COMPUTER MODEL OF THE SAND-STONE AQUIFER IN SOUTHEASTERN WISCONSIN,

Geological Survey, Madison, Wis. Water Resources Div. For primary bibliographic entry see Field 2F. W77-08478

ACTIVITIES OF THE WATER RESOURCES DIVISION IN CALIFORNIA. Geological Survey, Menlo Park, Calif. Water

Resources Div.
For primary bibliographic entry see Field 7C.
W77-08479

WATER RESOURCES DATA FOR CONNEC-TICUT, WATER YEAR 1975, Geological Survey, Hartford, Conn. Water Resources Div. For primary bibliographic entry see Field 7C.

DIGITAL-MODEL ANALYSIS · OF THE EF-FECTS OF WATER-USE ALTERNATIVES ON SPRING DISCHARGES, GOODING AND JEROME COUNTIES, IDAHO, Geological Survey, Boise, Resources Div. Idaho. Water

W77-08480

Idaho Department of Water Resources, Boise, Water Information Bulletin No 42, November 1976. 46 p, 19 fig, 5 tab, 11 ref.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B—Groundwater Management

Descriptors: "Groundwater resources, "Springs, "Water utilization, "Model studies, "Aquifer characteristics, Withdrawal, Water yield, Transmissivity, Groundwater recharge, Projections, Evaluation, "Alternative water use, "Idaho. Identifiers: "Snake Plain aquifer(Idaho).

The users of water from the springs that discharge from the Snake Plain aquifer in Gooding and Jerome Counties, Idaho, are concerned about the potential effects that increased pumpage and changing irrigation practices may have on spring discharge. Before development of irrigated land on the Snake River Plain, the springs between Kimberly and King Hill contributed an estimated 4,200 cubic feet per second to the flow in Snake River. As agricultural lands were developed, increasing amounts of irrigation-return flow caused an increase in spring discharge. In 1966, the total spring flow exceeded 6,000 cubic feet per second. Now, increasing amounts of pumpage may reverse the trend. Using power-consumption data, 1973 pumpage for irrigation in southern Gooding and western Jerome Counties was estimated to be nearly 85,000 acre-feet. A hydrologic model was constructed to effects of various management evaluate the schemes on discharge from the springs. A constant-head boundary was simulated at the east edge of the study area to facilitate future interface with larger scale models of the entire Snake Plain aguifer. The springs, modeled as head-dependent flow, respond to stress placed on the system. Output from the model includes a map showing waterlevel decline and a table of computed discharges for the 12 major springs. (Woodard-USGS)

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1975.

Geological Survey, Albany, N.Y. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-08485

A POSTSCRIPT TO THE MUTUAL PRESCRIP-TION DOCTRINE--CITY OF LOS ANGELES V CITY OF SAN FERNANDO, For primary bibliographic entry see Field 6E.

For primary bibliographic entry see Field 6E. W77-08490

ALLOCATING BURIED TREASURE: FEDERAL LITIGATION INVOLVING INTERSTATE GROUND WATER,

For primary bibliographic entry see Field 6E. W77-08491

4C. Effects On Water Of Man's Non-Water Activities

SUMMARY OF SOME CURRENT AND POSSIBLE FUTURE ENVIRONMENTAL PROBLEMS RELATED TO GEOLOGY AND HYDROLOGY AT MEMPHIS, TENNESSEE, Geological Survey, Nashville, Tenn. Water

Resources Div.

W. S. Parks, and R. W. Lounsbury.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 513/AS, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 4-76, January 1976. 34 p. 12 fig, 3 tab, 26 ref.

Descriptors: *Hydrologic aspects, *Urbanization, *Industries, *Environmental effects, *Hydrogeology, Water pollution sources, Waste disposal, Floods, Earthquake engineering, Geology, Aggregates, Foundations, Water resources, Evaluation, Planning, Land use, *Tennessee. Identifiers: *Memphis(Tenn).

This report summarizes information concerning many aspects of the geology and hydrology at Memphis, Tenn. It also outlines some of the current problems related to the local geology and hydrology or ones that may arise as a result of urbanization and industrialization of the area. The city is in the Coastal Plain physiographic province and is underlain at shallow depths by sand, clay, silt, gravel, and lignite. These post-Midway strata (Wilcox and younger) make up geologic units belonging to the uppermost Paleocene, Eocene, and Pliocene () Series of the Tertiary System and to the Pleistocene and Holocene Series of the Quaternary System. Environmental problems of immediate or future concern are associated with six general topics: (1) aggregate resources, (2) foundation materials, (3) earthquake hazards, (4) flood hazards, (5) water resources, and (6) solid waste disposal. Consideration of these topics provide an overall insight into the close interrelation of the problems and the need for coordinated studies of the geology and hydrology at Memphis. (Woodard-USGS)

THE EFFECTS OF URBANIZATION ON LOW FLOWS AND TOTAL RUNOFF,
Purdue Univ., Lafayette, Ind. School of Civil En-

gineering. For primary bibliographic entry see Field 2A. W77-08335

WATER QUALITY IMPACTS OF URBANIZA-TION-A METHODOLOGY, Economic and Social Commission for Asia and the

Economic and Social Commission for Asia and the Pacific (UN), Bangkok (Thailand). Div. of Industry, Housing, and Technology.

For primary bibliographic entry see Field 5B. W77-0831.

4D. Watershed Protection

AMERICAN SEDIMENTATION LAW AND PHYSICAL PROCESSES, For primary bibliographic entry see Field 6E. W77-08130

SEDIMENT YIELD AND LAND USE IN SOUTHWEST UNITED STATES, Geological Survey, Lakewood, Colo. Water Resources Div.

R. F. Hadley.
In: Effects of Man on the Interface of the Hydrological Cycle with the Physical Environment; Proceedings of Paris Symposium, September 1974. International Association of Hydrological Sciences Publication No 113, p 96-98, 1974. 2 tab. 4 ref.

Descriptors: *Sediment yield, *Land use, *Southwest U.S., *Colorado River basin, *Erosion control, Evaluation, Semiarid climates, Livestock, Range grasses.

Comparison of the sediment discharge records at the Grand Canyon gaging station (Lees Ferry, Arizona) on the Colorado River for the two periods, 1926-1941 and 1942-1969 show that the suspended-sediment loads for the latter period are only 50 per cent of the earlier period. These data combined with studies of erosion on the Colorado Plateau rangelands indicate that changes in land use probably are responsible for much of the reduction in the sediment yield. Livestock numbers have been greatly reduced on the arid and semiarid rangelands in the past 20 years and erosion control practices have been initiated in many critically eroding areas. Experimental studies by the Geological Survey indicate that grazing control alone can reduce runoff by as much as 30 per cent and sediment yield by 40 per cent. (Woodard-USGS)

DATA FOR CALIBRATING UNSTEADY-FLOW SEDIMENT-TRANSPORT MODELS, EAST FORK RIVER, WYOMING, 1975, Geological Survey, Lakewood, Colo. Water Resources Div. For primary bibliographic entry see Field 7C. W77-08180

RAINFALL INFILTRATION CHARAC-TERISTICS FOR A SEMI-ARID WATERSHED SOIL, Arizona Water Resources Research Center, Tuc-

son.
For primary bibliographic entry see Field 2G.
W77-08206

APPLICATION OF THREE DAILY-RAINFALL RUNOFF MODELS TO FOUR AUSTRALIAN CATCHMENTS, Monash Univ., Clayton (Australia). Dept. of Civil

Monash Univ., Clayton (Australia). Dept. of Civi Engineering. For primary bibliographic entry see Field 2A. W77-08218

MULTIPLE OBJECTIVE PLANNING: SMALL WATERSHEDS, Purdue Univ., Lafayette, Ind. Dept. of Agricul-

tural Economics.
For primary bibliographic entry see Field 6B.
W77-08350

A FINITE ELEMENT MODEL TO DETERMINE THE EFFECT OF LAND-USE CHANGES ON FLOOD HYDROGRAPHS, Virginia Polytechnic Inst. and State Univ.,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering. For primary bibliographic entry see Field 8B. W77-08450

SMALL-STREAM FLOOD INVESTIGATIONS IN MINNESOTA, OCTOBER 1958 TO SEP-TEMBER 1975,

Geological Survey, St. Paul, Minn. Water Resources Div. For primary bibliographic entry see Field 2E.

For primary bibliographic entry see Field 2E. W77-08481

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1976,

Geological Survey, Helena, Mont. Water Resources Div. For primary bibliographic entry see Field 2E. W77.08482

CHEMICAL AND VEGETATIVE STABILIZA-

TION OF SOILS, Bureau of Reclamation, Denver, Colo. Engineering and Research Center. For primary bibliographic entry see Field 8D. W77-08512

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

FULVIC ACID-METAL ION INTERACTIONS IN WATER.

New Hampshire Univ., Durham. Dept. of Chemistry.

J.H. Weber, and S. A. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 597, Price codes: A04 in paper copy, A01 in microfiche. New Hampshire Water Resources Research Center, Durham, Completion Report, Research

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants-Group 5A

Report No. 14, (1977). 45 p, 12 tab, 40 ref. OWRT A-035hNH (2), 14-31-0001-3829.

Descriptors: *Acids, Acidic soils, *Fulvic acids, *Humic acids, *New Hampshire, Soil chemistry, *Soil analysis, *Podzols, Analytical techniques, Spectrophotometry, Volumetric analysis, *Pollutant identification, Chemical analysis. Identifiers: Para-benzosemiquinone, *Elec spin resonance, Oyster River(NH), Metal ions.

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This report emphasized the further characteriza-tion of fulvic and humic acids isolated from the B2 horizon of a Podzol soil obtained at Conway, N. H. and isolated from the Oyster River (Lee, N. H. H. and isolated from the Oyster River (Lee, N. H.). The authors measured the E4/E6 ratios (absorbance ratio at 465 nm/665 nm) and the absorptivities of all the humic material samples. The authors also describe the cryoscopic determination of the dissociation-corrected number-average molecular weights Mn(corr) of the soil and aquatic fulvic acid samples. The corrections for dissocia-tion of fulvic acid were determined by a theory which utilizes the equivalents per gram and the acid dissociation constants of the fulvic acid samples. The soil and aquatic fulvic acid Mn(corr) values are 644 and 626, respectively. The authors analyzed the solid state and aqueous solution electron spin resonances (esr) spectra of the aquatic and soil fulvic and humic acids. Because the aqueous solution esr spectra mimic the behavior of the model compound para-benzosemiquinone, it was concluded that semiquionone free radicals predominate in fullyic acid. In addition, a decrease in spin concentration at a potential of 0.20 volts (vs. SCE) demonstrates that the semiquinone radicals are at least partially responsible for the reduc-ing capability of humic materials. From the above results, a quantitative semi-quinone analysis for humic materials was devised.

THE UTILITY OF PALEOLIMNOLOGICAL ANALYSES OF LAKE SEDIMENTS FOR EVALUATING ACID PRECIPITATION EFFECTS ON DILLUTE LAKES, Cornell Univ., Ithaca, N.Y. Dept. of Natural

Resources. C. L. Schofield, and J. N. Galloway.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 595, Price codes: A03 in paper copy, A01 in microfiche. Center for Environmental Research, Cornell University, Ithaca, New York. Completion Report, May 1977. 23 p. 16 fig, 3 tab, 21 ref. OWRT A-071-NY(1). 14-34-0001-7067.

Descriptors: *Paleolimnology, *Diatoms, Sediments, Lakes, *Lake sediments, Hydrogen ion concentration, Bioindicator, Pollutant identification, Acids, Ions, Precipitation(Atmospheric).
Identifiers: *Acid precipitation, Microfossils, Dilute lakes.

Sediment cores were collected from three Adirondack Mountain lakes exhibiting a wide range in pH (Honnedaga Lake, pH 4.7; Woodhull Lake, pH 5.2; Seventh Lake, pH 6.5) in July, 1975. Diatom microfossils present in the cores were categorized in terms of pH preference and an index (alpha) based on the ratio of acidophilous to alkaliphilous units was determined. The regression of index (alpha) for surficial sediments on lake pH (pH = 6.63 - .81 log alpha) was utilized to estimate lake pH for historical sediment layers. Honnedaga Lake exhibited a marked increase in acidophilous taxa in the uppermost cm. of sediment and a decrease in estimated pH from 5.5-6.0 for historical sediments to pH 5.0 for recent sediments. The other lakes showed no significant change in index alpha and estimated pH. The known history of recent acidification in Honnedaga Lake suggests that pH indices based on diatom microfossils may be sensitive indicators of lake acidification. W77-08103

CONTINUOUS AUTOMATED MONITORING OF CHEMICAL AND PHYSICAL CHARAC-TERISTICS OF THE RED CEDAR RIVER, Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

R. C. Ball, M. E. Stephenson, and T. W.

Hardgrove.

Hardgrove.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-242115, Price codes: A05 in paper copy, A01 in microfiche. Michigan State University Institute of Water Research, Technical report No. 8, September 1969. 91 p, 19 fig, 7 tab, 38 ref. M.S. Thesis. OWRT A-023-MICH(2). 14-01-0001-1482, FWPCA Training Grant 5T1-WP-109.

Descriptors: *Michigan, *Chemical properties, *Physical properties, *Monitoring, *Instrumentation, Water properties, Data collections, Dissolved oxygen, Temperature, Automation, Conductivity, Alkalinity, Turbidity, Sediments, Seasonal, Hydrogen ion concentration, Phosphorus, Chlorides, Analytical techniques, Dissolved oxygen analyzers, Water temperature, Dismal Onesite investigations

Dissolved oxygen analyzers, water temperature, Diurnal, On-site invettigations.

Identifiers: *Automated monitoring, *Red Cedar River(Mich), *Continuous monitoring, Benthoplankton concentration, Sediment scouring, Warm-water stream, Continuous automated monitor, Specific conductance, Total phosphorus,

Autotroph.

A continuous automated monitor on the Red Cedar River at East Lansing, Michigan, was operated from August, 1967, to August, 1968. Dissolved oxygen, water temperature, specific conductance, and pH were measured. In addition, total alkalinity, total phosphorus concentration were spot checked. Seasonal patterns and possible interrelationships of the various parameters were sought. The alkalinity and pH determinations indicated the river was highly buffered. Specific conductance measurements revealed the existence of drain discharges resulting in pronounced conductance peaks. Dissolved oxygen levels fell dangerously low only during the months of August and September. A change in the diurnal character of oxygen levels was noted after removal of macrophytes from the stream due to scouring during intense runoff. Total phosphorus concentration increased initially during a flood, then decreased because of dilution. The concentration again increased as the discharge started to decrease. Dissolved oxygen concentration was inversely related to total phosphorus concentration. The roles of turbidity and sediment scouring have a definite effect upon autotroph production as evidenced by the increased load of detached a definite effect upon autotroph production as evidenced by the increased load of detached chlorophyll-bearing material after intense runoff. (Henley-ISWS) W77-08110

DETERMINATION OF PYRIDINE IN FARM CROPS AND FISH, (IN RUSSIAN), Kiev Inst. of Nutritional Hygiene (USSR). L. R. Polishchuk, and L. A. Stempkovskaya. Gig Sanit. 2, p 69-70, 1974.

Descriptors: *Pollutant identification, *Analytical techniques, Agriculture, Fish, *Methodology, Crops, *Potatoes, Water pollution. Identifiers: *Pyridine.

A method of determining pyridine (an environ-mental pollutant) in agricultural crops and fish based on the reaction with barbituric acid and the conditions for its quantitative extraction from the conditions for its quantitative extraction from the investigated objects and the preparation of extracts free from admixtures interfering with the determination were developed. Two methods are described, 1 for all products and the other for all products except potatoes. The determination error does not exceed +10%, sensitivity is 0.2 mg/kg and the time required for 3 parallel determinations is 1 1/2-2h.—Copyright 1975, Biological Abstracts,

WATER RESOURCES DATA FOR INDIANA. WATER YEAR 1975, Geological Survey, Indianapolis, Ind. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08162

GROUND-WATER DATA FOR 1974-75 IN JOSHUA TREE NATIONAL MONUMENT, CALIFORNIA, Geological Survey, Menlo Park, calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08164

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR NEW ORLEANS, LOUISIANA (LAKE PONTCHARTRAIN, LOUISIANA, AND VICINITY HURRICANE PROTECTION PROJECT), Geological Survey, Baton Rouge, La. Water Resources Div. For primary bibliographic entry see Field 8D. W77-08165

WATER RESOURCES OF THE MYAKKA RIVER BASIN AREA, SOUTHWEST FLORIDA, Geological Survey, Tallahassee, Fla. Water Resources Div. For primary bibliographic entry see Field 4B. W77-08167

U S GEOLOGICAL SURVEY, WATER RESOURCES DIVISION, RADIOCARBON MEA-SUREMENTS I, Geological Survey, Reston, Va. Water Resources For primary bibliographic entry see Field 4B. W77-08169

GROUND-WATER RESOURCES OF VAN-GROUND-WATER RESOURCES OF VAN-DERBURGH COUNTY, INDIANA, Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, St. Paul, Minn. Water Resources Div. For primary bibliographic entry see Field 4B. W77-08170

INVESTIGATION OF DETECTION LIMITS FOR SOLUTES IN WATER MEASURED BY LASER RAMAN SPECTROMETRY, Smithsonian Institution, Washington, D.C.; and Geological Survey, Lakewood, Colo. Water Resources Div. For primary bibliographic entry see Field 2K. W77-08171

GROUND WATER IN THE SAN JUAN METROPOLITAN AREA, PUERTO RICO, Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div. For primary bibliographic entry see Field 4B. W77-08173

GEOHYDROLOGY OF THE ALBIN AND LA GRANGE AREAS, SOUTHEASTERN WYOM-Geological Survey, Cheyenne, Wyo. Water Resources Div. For primary bibliographic entry see Field 4B. W77-08176

GROUND-WATER BASIC DATA FOR RAMSEY COUNTY, NORTH DAKOTA, Geological Survey, Bismarck, N. Dak. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08177

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

COMPARATIVE EXAMINATION OF EN-TEROCOCCI OBTAINED FROM DRINKING WATER, FOODSTUFFS AND URINE, (IN GER-MAN), N. Rakarowa, and K. Paparkowa. Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 158(2), p 194_198 1973

194-198, 1973

Descriptors: *Potable water, *Enteric bacteria, *Streptococci, Sampling, Epidemiology, *Urine, *Foods, *Pollutant identification, Isolation, Water pollution effects, Human diseases. Identifiers: Bacteriocins.

*Enterococci, Streptococcus-Faecalis, Streptococcus-Faecium.

Examination of enterococci isolated from urine of patients with urogenital infections revealed only Streptococcus faecalis strains. Only S. faecium strains were isolated from water samples. Both groups were equally represented among food iso-lates. There was a complete correlation between the phage sensitivity and the enterocinogenity of the enterococci isolated from urine. Both characteristics probably are important as epidemiological markers for the pathogenicity of the enterococci.--Copyright 1975, Biological Abstracts, Inc. W77-08179

SELECTED HYDROLOGIC DATA, UINTA BASIN AREA, UTAH AND COLORADO, Geological Survey, Salt Lake City, Utah. Water Resources Div. For primary bibliographic entry see Field 7C. W77-08183

WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1975, Geological Survey, Champaign, Ill. Water

Resources Div. For primary bibliographic entry see Field 7C. W77-08184

WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1975, Geological Survey, Carson City. Nev. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-08185

A STATISTICAL ANALYSIS OF THE MERCURY CONCENTRATIONS IN FISH FROM LAKE

JOCASSEE, SOUTH CAROLINA, Clemson Univ., S.C. Dept. of Environmental Systems Engineering. H. D. Lienert, and W. C. Rowell.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267 670, Price codes: A04 in paper copy, A01 in microfiche. December 1976. 54p, 11 fig., 8 tab., 12 ref., 3 ap-pend. OWRT A-032-SC(2).

Descriptors: *Mercury, *Reservoirs, *Bass, Trout, Statistical methods, *South Carolina, *Brown trout, Lakes, Pollutant identification, Lethal limit, Water quality standards, Absorption. Identifiers: *Lake Jocassee(SC).

Mercury concentration in the axial muscle of fish from Lake Jocassee was determined. The predominant species tested were Largemouth Bass and Brown Trout. Models were built at the ninety-five percent confidence level with respect to lake, species, and year of collection. Statistical techniques were used to discriminate between models to determine if a trend was present. It was determined that there was a definite need for more fish samples and some modifications in data colnsh samples and some modifications in data con-lection. It was also determined that sampling should be limited to actively growing individuals rather than to older fish which are growing in weight more than in length. The concentration of mercury were higher than the Federal Food and Drug Administration's 0.5 ppm recommended alW77-08190

ARSENIC IN WATER AND FISH FROM LAKES HARTWELL, KEOWEE, AND JOCASSEE, SOUTH CAROLINA, Clemson_Univ., S.C. Dept. of Environmental

Systems Engineering. J. M. Harden.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267 671, Price codes: A03 in paper copy, A01 in microfiche, August 1976, 31 p, 6 tab, 40 ref, append. OWRT A-032-SC(1).

Descriptors: *Arsenic, Fish, Reservoirs, *South Carolina, Lethal limit, Water quality standards, *Pollutant identification, Lakes, Water pollution, Absorption. Identifiers: Lake Hartwell(SC). Keowee(SC), Lake Jocassee(SC).

Arsenic concentrations in fish and water samples from Lakes Hartwell, Keowee, and Jocassee were determined. All concentrations in fish were below FDA recommended limits, and all concentrations in water were below USPHS Drinking Water Standards. One possible trend was observed, i.e., arsenic concentrations in fish followed the order Jocassee > Hartwell > Keowee. No other trends were apparent. W77-08191

A SURVEY OF CADMIUM OCCURRENCE AND CONCENTRATION IN FISH FROM ELEVEN MAJOR RESERVOIRS IN SOUTH CAROLINA, Clemson Univ., S.C. Dept. of Environmental

Systems Engineering. M. H. Davis

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 668, Price codes: A03 in paper copy, A01 in microfiche. December 1976. 33 p, 1 fig, 11 tab, 55 ref, append. OWRT A-032-SC(3).

Descriptors: *Cadmium, *Heavy metals, Fish, *Reservoirs, South Carolina, *Pollutant identification, Absorption, Surveys.

A total of 136 fish were collected from 11 South Carolina reservoirs and analyzed for the concentration of accumulated cadmium. All samples contained less than 5 micro-g cadmium per gram of tis-sue with a mean value of 0.138 micro-g/g.

ORGANOCHLORINE RESIDUES IN NEW ZEA-LAND BIRDS AND MAMMALS POLYCHLORINATED BIPHENYLS. Department of Agriculture, Wellington (New Zea-

land). Wallaceville Animal Research Center For primary bibliographic entry see Field 5C. W77-08210

SORPTION AND FLOW OF CARBON DIOXIDE AND SOME HYDROCARBONS IN MICROPOROUS CARBON MEMBRANE, Imperial Coll. of Science and Technology, London

(England). Dept. of Chemistry. R. Ash, R. M. Barrer, and P. Sharma. Journal of Membrane Science, Vol. 1, No. 1, p 17-32, March 1976. 7 fig, 5 tab, 20 ref.

Descriptors: *Membrane processes, *Membranes, Flow, *Laboratory tests, Gases, Carbon dioxide, Helium, Diffusion, Permeability, Sorption, Isotherms, Analytical techniques, Mathematical models, Analysis, Organic compounds. Identifiers: Carbolac carbon membranes.

The flow of He, CO2, CH4, C2H6, C3H8, n-C4H10, and neo-C5H12 was investigated using microporous carbon membranes. Physical constraint of the compacted carbon with steel plun-gers in a steel membrane holder substantially altered sorption equilibria and hysteresis loops in the multilayer and capillary condensation region as compared with unconstrained powder, but made little difference in the region below monolayer coverage. Capillary pressure differences between contrained compact and unconstrained powder showed maxima in the vicinity of monolayer coverage and near coverages where differential diffusion coefficients also went through maxima, which supports a hydrodynamic mechanism for sorbed fluids as monolayer coverage was approached and exceeded. For these larger uptakes, flow rates were dominated by contributions arising from the presence of sorbed films with concentration gradients. Permeabilities did not show max-ima found with differential diffusion coefficients. Blockage by sorbed films of the gas phase transport of helium was investigated for hydrocarbons using helium as internal indicator. Blockage became nearly complete as sorption approached monolayer coverage. (Humphreys-ISWS) W77-08232

IMPURITY CONCENTRATIONS IN SEA ICE, McGill Univ., Montreal (Quebec). Dept. of For primary bibliographic entry see Field 2C. W77-08237

NITROGEN AND PHOSPHORUS ANALYSES OF RAINFALL AT ROTORUA, NEW ZEA-LAND,

Marine Dept., Rotorua (New Zealand). Fisheries Research Div. G. R. Fish

Journal of Hydrology (New Zealand), Vol. 15, No. 1, p 17-26, 1976. 1 fig, 6 tab, 10 ref, 1 append.

Descriptors: *Nitrogen, *Phosphorus, *Nitrogen compounds, *Phosphorus compounds, *Rainfall, Water quality, Analytical techniques, Nitrites, water quanty, Analytical techniques, Nittates, Autrients, Phosphates, Water pollution sources, Precipitation(Atmospheric), Meteorology, Chemical analysis, *Pollutant identification, Path of pollutants.

Identifiers: *Lake Rotorua(New Zealand),

*Rotorua(New Zealand), Rainstorms, Rainwater

Analyses of the dissolved inorganic nitrogen and phosphorus content of rainfall at Ngapuna, Ro-torua, were made between 21 July 1972 and 19 March 1974. Dry fallout was excluded from the water samples by exposing collectors only when rain was falling or was imminent. The total rainfall sampled was 341 mm, and its mean solute concentration expressed in g/ha.mm (=g/cu m x 10) was 0.057 P04-P, 0.842 NH4-N and 0.215 N03-N. The mean solute concentration of 34 rainstorms (in g/ha.mm) was 0.08 P04-P, 1.83 NH4-N and 0.43 N03-N. No seasonal changes in solute concentrations were discovered. Synoptic samples collected in open country (e.g., Tongariro National Park) were similar in composition to those from Ngapuna, Rotorua, but samples collected at city sites (e.g., Christchurch) contained more phosphate. (Henley-ISWS) W77-08242

THE FALLOUT OF NITROGEN AND PHOSPHORUS COMPOUNDS FROM THE AT-MOSPHERE AT NGAPUNA, NEAR ROTORUA, NEW ZEALAND.

Marine Dept., Rotorua (New Zealand). Fisheries G. R. Fish

Journal of Hydrology (New Zealand), Vol. 15, No. 1, p 27-34, 1976. 2 fig, 2 tab, 8 ref.

Descriptors: *Fallout, *Nitrogen, *Nitrogen compounds, *Phosphorus, *Phosphorus compounds, Analytical techniques, Ammonia, Nitrates, Nutrients, Phosphates, Water pollution sources, Meteorology, Chemical analysis, Fertilization, Eutrophication.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants-Group 5A

Identifiers: *Nitrogen compounds, *Lake Rotorua(New Zealand), *Rotorua(New Zealand).

A total of 183 samples of atmospheric fallout, usually collected over periods of 24 hours (never longer than 3 days) between April 1974 and April 1975, was analyzed for N and P content. Local 1975, was analyzed for N and P content. Local bush fires and pollen-fall caused some changes in fallout quality, but seasonal effects generally were slight. Dry fallout contributed 0.37 g/ha.day P04-P and 0.77 g/ha.day total P (36 and 54% of the deposition on raindays), while the nitrogen contribution was 1.03 g/ha.day NH4-N and 0.24 g/ha.day N03-N (10 and 7% of the rainday deposition). The data were compared to those collected respicusly an rainfall only. The data were determined to the content of the content non). The data were compared to those collected previously on rainfall only. The data were used to improve the estimate of the atmospheric contribution to the nutrient budget of Lake Rotorua. (Henley-ISWS)
W77-08243

BACTERIOLOGICAL INVESTIGATION OF AL-BERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SALMONELLA ISOLA-

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Environmental Protection Service, Edmonton (Alberta). Microbiology Lab. For primary bibliographic entry see Field 5D. W77-08269

CHELATING AGENT ANALYSIS BY HIGH SPEED LIQUID CHROMATOGRAPHY, Missouri Univ., Columbia. Dept. of Chemistry. D. R. Jones, IV.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 918, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. thesis, July, 1976. 176 p, 20 fig, 12 tab, 127 ref. OWRT B-095-MO(5), 14-31-0001-4099.

Descriptors: *Chelation, *Pollutant identification, Chromatography, *Heavy metals, Copper, Methodology, Analytical techniques, Path of pol-lutants, Spectrophotometry, Monitoring, Sewage effluents, Nitrilotriacetic acid, *Waste water treat-

Identifiers: Metal plating wastes, Organometallics, EDTA, *Chelating agents, Atomic absorption, Spectrophotometry.

Chelating agents are important species in the transport and reactions of heavy metals in water. Methods for their analysis are needed. Described are methods of analysis for chelating agents based primarily on the separation of copper chelates by high speed liquid chromatography followed by monitoring of the copper-containing effluents by atomic absorption spectrophotometry. Details of the interface between the high speed liquid chromatograph and the atomic absorption spec-trophotometer are described. Operating parameters for the chromatograph to make it compatible with atomic absorption are detailed. Separation and analysis conditions are given. The technique as applied to sewage effluents is discussed. W77-08286

DETECTION OF PHOSPHATE ADSORPTION ONTO COAL HUMIC ACIDS, Missouri Univ.-Columbia. Dept. of Chemistry.

L. O. Isselhardt.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 998, Price codes: A06 in paper copy, A01 in microfiche. M.A. Thesis, December 1975. 106 p, 14 fig, 13 tab, 58 ref. OWRT B-110-MO(2), 14-31-0001-4170.

Descriptors: Coal, *Humic acids, *Phosphates, Adsorption, *Coal mine wastes, *Pollutant identification, Phosphorus, Waste water treatment, Water reuse, Pollution abatement, Absorption, Separation techniques. Identifiers: Adsorption isotherms, Iron humate.

Because of their acid-base, sorption, and chelation-properties, coal humic acids have some potential applications in treating some of the pollutants aris-ing from the mining, combustion, and conversion of coal and from stack gas scrubber effluents. This thesis is part of a research program designed to determine the interaction of coal humic acids with a variety of species found in wastewaters. The upa vaniety of species found in wastewaters. In eu-take of orthophosphates and polyphosphates by solid coal humic acids was examined. The prepara-tion and purification of coal humic acids and iron humates are described. Details are given for the humates are described. Details are given for the difficult analysis of phosphates in the presence of humic substances. It was found that coal humic acids adsorb phosphates very poorly. Since these materials effectively remove heavy metal ions from water the possibility is raised of selectively removing dangerous heavy metal ions while leaving nutrient phosphate in the water for fertilizer in water used for land reclamation or crop irrigation.

DEVELOPMENT OF A COLUMN CHROMATOGRAPHY METHOD FOR FIELD OF PRE-CONCENTRATION OF TRACE METALS WITH APPLICATION TO THE HAW-CAPE FEAR

RIVERS, N.C., North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.

Vironmental Sciences and Engineering.

J. H. Dempsey.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 878, Price codes: A05 in paper copy, A01 in microfiche.

M.S. Degree in Public Health, 1976. 74 p. 8 tab, 6 fig, 46 ref. OWRT A-073-NC(1), 14-31-0001-5033.

Descriptors: *Chromatography, *Trace elements, *Metals, *Heavy metals, Ion exchange, Adsorption, Cadmium, Chromium, Copper, Mercury, Zinc, Rivers, North Carolina, Pollutant identification, Resins, Analytical techniques, Methodology, Water pollution sources.

Identifiers: *Trace metals, Dissolved trace metals, Ion exchange column, Resins, Haw River(NC), Cape Fear River(NC).

Column chromatography was investigated for adaptation as a field technique for concentrating dissolved trace metals from natural waters. Manganese oxide impregnated acrylic fibers, a chelating resin (Chelex 100), a cation exchange resin (AG-50W) and an anion exchange resin (AG-1) were employed in preliminary work. Ion exchange resins were the most satisfactory and the final design for field use consisted of a cation and an anion exchange column in series. Natural water spiked with CRS1 as a tracer indicated that soluble spiked with CR51 as a tracer indicated that soluble Cr(III) and Cr(VI) could be separated by the technique. A portable field unit was constructed and used to carry out a one year survey of Cd, Cr, Cu, Pb, and Zn in the Haw-Cape Fear Rivers of North Carolina. Elevated concentrations of Cr, Cu, and Cd were observed in the upper industralized areas while Zn and Pb appeared to have sources throughout the basin. Concentration ranges in microgram/I were <0.10-1.22 Cd, <0.1-26.8 Cr, 0.0-9.1 Cu, 1.1-74.0 Pb and 2.9-74.0 Zn. (Stewart-NC State) (Stewart-NC State) W77-08299

MERCURY ACCUMULATION IN TROUT OF SOUTHERN MISSOURI, Missouri Univ.-Rolla. Dept. of Chemistry. For primary bibliographic entry see Field 5C.

CHROMOSOME MUTATIONS IN A FERN POPULATION GROWING IN A POLLUTED ENVIRONMENT: A BIOASSAY FOR MUTAGENS IN AQUATIC ENVIRONMENTS,

Massachusetts Univ., Amherst. Dept. of Botany. E. J. Klekowski, and B. B. Berger. American Journal of Botany, Vol. 63, No. 2, p. 239-246, February 1976. 16 fig. 3 tab, 3 ref. OWRT A-063-MASS(2), 14-31-0001-5021. Descriptors: *Bioassay, *Massachusetts, Water pollution effects, *Ferns, Industrial wastes, Pollutant identification, Cytological studies, Spores,

Aquatic plants.
Identifiers: *Chromosome mutations, *Osmunda regalis, *Millers River(Mass).

A population of royal ferns, Osmunda regalis, is periodically submersed by the waters of the Millers River was found to have a very high frequency of chromosome mutations. The Millers River is located in western Massachusetts and is heavily polluted with industrial wastes. Approximately 43% of meiotic samples collected in 1973 from the Millers River population were heterozygous for mutations such as paracentric inheterozygous for mutations such as paracentric inversions or reciprocal translocations, whereas less than 1% of meiotic samples from nearly non-polluted control populations were such heterozygotes. Cytological analysis within royal fern clones indicates that practically all of the chromosome mutations were post-Zygotically induced and that at least 64% were induced since 1969. Over 26,000 spore mother cells were analyzed for chromosome aberrations.

W77-08305

PYRO- AND TRIPOLY-PHOSPHATE CON-TENTS OF SEDIMENTS, Missouri Univ.-Columbia. Dept. of Agronomy. R. W. Blanchar, and D. C. Riego. Water, Air and Soil Pollution, Vol. 7, p 27-31, 1977. 1 fig. 2 tab, 6 ref. OWRT A-059-MO(3), USDI-OWRR-14-31-0001-3825.

Descriptors: *Phosphates, Phosphorus, *Sediments, *Pollutant identification, Methodolo-Phosphorus. gy, Analytical techniques, Chromatography, Anion exchange. Identifiers: *Polyphosphates, *Pyrophosphates, Analytical techniques, Chromatography,

*Sediment analysis

A method to determine pyrophosphate (PP) and tripolyphosphate (TPP) in sediments was developed. Sediment was extracted with 2% EDTA + 0.1 M NH4F followed by a second ex-EDIA + 0.1 M NHAF IONOWED by a second extract of 2% EDTA + 1N NaOH. Orthophosphate (OP), PP, and TPP were separated by anion exchange chromatography, the fractions collected, and P determined after extraction into isobutanol. The limit of detection of the method isobutanol. The limit of detection of the method was 0.5 micro-g P g-1 sediment. Fourteen sediments were tested and the highest TPP found was 1.8 micro-g P g-1 sediment. Thirteen of the sediment samples contained less than 1 micro-g P g-1 as TPP. Only three of the 14 samples contained more than 1 micro-g P g-1 as PP. The highest level of PP (8.5 micro-g P g-1) was found in sediment from an animal waste lagoon. The error for samples containing 36.9 micro-g P g-1 as PP was plus or minus 7.6, and for TPP at 12.3 micro-g P g-1 the error was plus or minus 3.3. The values for PP and TPP were underestimated by 6 and 36%, respectively. tively. W77-08306

EFFECT OF SOME CHEMICAL ELEMENTS ON THE ACCUMULATION OF CESIUM-137 IN FRESHWATER FISH, (IN RUSSIAN), Ministersivo Zdravookhraneniya SSSR, Moscow.

Institut Biofiziki. For primary bibliographic entry see Field 5C. W77-08322

A PRODUCTIVITY STUDY OF THE ROANOKE RIVER ABOVE NIAGRA DAM IN VIRGINIA, Virginia Polytechnic Inst. And State Univ., Blacksburg. Dept. of Civil Engineering. For primary bibliographic entry see Field 5C. W77-08333

FLUORIDE ANALYSIS OF WATER-TREAT-MENT-PLANT SLUDGES, Auburn Univ., Ala. Dept. of Civil Engineering. For primary bibliographic entry see Field SF.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A-Identification Of Pollutants

W77_08342

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, VOLUME 1-A, TECHNICAL SESSION PRESENTATIONS, AGRICULTURE-ENVIRONMENT. National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center. For primary bibliographic entry see Field 7B.

APPLICATION OF EREP. LANDSAT AND AIR-CRAFT IMAGE DATA TO ENVIRONMENTAL PROBLEMS RELATED TO COAL MINING, Earth Satellite Corp. Washington, D. C.

R. V. Amato, O. R. Russell, K. R. Martin, and C. E. Wier.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 309-327, September 1975, 8 fig. 2 tab, 7 ref.

Descriptors: *Coal mines, *Kentucky, *Indiana, *Remote sensing, *Environment, Land use, Strip mines, Mapping, Monitoring, Spoil banks, Mining, Water pollution sources, Surveys, Coal mine wastes, Land management, Land reclamation, Satellites(Artificial), Aerial photography, Evalua-

tion, Topography. Identifiers: LANDSAT, Skylab.

The synoptic and repetitive views of aerial remote sensing records offer valuable environmental and dynamic change data in areas of both surface and underground coal mining. Depending upon the accuracy of requirements, these data are available through both low and high level aircraft surveys as well as LANDSAT and EREP (SKYLAB) imagery. Remote sensors can provide timely and accurate information on surface mining status and reclamation progress, coal mine refuse piles and slurry ponds, acid water and silation problems, and various aspects of environmental impact. Remote sensing techniques were used to study coal mining sites within the Eastern Interior Coal Basin (Indiana, Illinois, and western Kentucky), the Appalachian Coal Basin (Ohio, West Virginia, and Pennsylvania), and the anthracite coal basins of northeastern Pennsylvania. Airborne sensors included multispectral scanners, multiband cameras, and standard mapping cameras loaded with panchromatic, color, and color infrared films. The research that was conducted in these areas is a useful prerequisite to the development of an operational monitoring system that can be employed periodically to supply state and federal regulatory agencies with supportive data. Further research, however, must be undertaken to systematically examine those mining processes and features that can be monitored cost effectively using remote sensors and for determining what combination of sensors and ground sampling processes provide the optimum combination for an operational system. (See also W77-08408) (Humphreys-ISWS) W77-08429

POSSIBILITIES AND ROLE OF BIOLOGICAL ANALYSIS IN EVALUATING THE DEGREE OF POLLUTION OF WATER BODIES, (IN RUS-SIAN),

Akademiya Nauk SSSR. Leningrad. Zoologicheskii Institut. A. V. Makrushin.

Gidrobiol Zh. 10(2), p 98-104, 1974.

*Bioindicators, Descriptors: *Industrial wastes, Toxicity, *Pollutant identifica-tion, *Bacteriology, Analytical techniques, Pota-ble water, Water quality standards.

Using biological analysis (indicator organisms), it is possible to detect one-time or continuous pollution. The biological method permits finding the source of pollution by moving upstream. The source is found by chemical and bacteriological methods only if pollution is constant. Biological analysis is cheaper and faster than bacteriological chemical analysis. Using the biological method, pollution by industrial wastes can be de-tected where it cannot be found by other methods. The existing variants of biological analysis need improvement, but because of the high sensitivity aquatic organisms to the prolonged effect of small concentrations of toxic substances the composition of aquatic biocenoses is the best criterion of the fitness of water for human consumption .--Copyright (c) 1975, Biological Abstracts, Inc. W77-08430

QUANTITATIVE WATER QUALITY WITH LANDSAT AND SKYLAB. Kansas Univ., Lawrence.

H. L. Yarger, and J. R. McCauley In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session

Fresentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 347-370, September 1975. 21 fig, 2 tab, 16 ref.

Descriptors: *Water quality, *Remote sensing, *Kansas, *Surface waters, Reservoirs, Water temperature, Dissolved solids, Suspended solids, Secchi disks, Phosphates, Potassium, Nitrates, Analysis, Monitoring, Satellites(Artificial),

Chlorophyll, Measurement. Identifiers: LANDSAT, Skylab.

LANDSAT Multispectral Scanner reflectance levels are useful for quantitative measurement of suspended solids up to at least 900 ppm. MSS band ratios derived from computercompatible tape (CCT) can measure suspended solids with 67% confidence level accuracy of 12 ppm over the range 0-80 ppm, and 35 ppm over the range 0-900 ppm. Suspended solids contour maps can be easily constructed from CCT's for water bodies larger than approximately 100 acres. Rationing suppresses MSS reflectance level dependence on seasonal sun angle variation and permits measurement of suspended load the year round in the middle latitudes. These LANDSAT results are based on correlation studies between MSS CCT's and 170 water samples taken from three large Kansas reservoirs coincident with 16 different LAND-SAT passes over a period of 13 months. Skylab imagery, S190A and S192, from a single pass over three reservoirs, compared favorably to LAND-SAT results up to 100 ppm. No samples were obtained with suspended solids greater than 100 ppm during the Skylab overpass. Typical mid-continent values for variables such as sun angle, wind speed, values for variables such as sun angle, who speed, and temperature, do not significantly affect the correlation between satellite band ratios and suspended solids. The relatively high inorganic suspended solids, characteristic of mid-continent reservoirs, dominate the reflected energy present in the satellite spectral bands. Dissolved solids concentrations up to 500 ppm and algal nutrients up to 20 ppm are not detectable. The RED/GREEN ratio may have a weak negative correlation with total chlorophyll above about 8 micrograms/l. (See also W77-08408) (Humphreys ISWS) W77-08431

LANDSAT-1 DATA AS IT HAS BEEN APPLIED FOR LAND USE AND WATER QUALITY DATA BY THE VIRGINIA STATE WATER CONTROL

Virginia State Water Control Board, Richmond. Div. of Surveillance and Field Studies.

Trexler, and J. L. Barker.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume

I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 371-418, September 1975. 22 fig, 7 tab, 7 ref.

Descriptors: *Water quality, *Land use, *Remote sensing, *Virginia, *Monitoring, Reservoirs, Descriptors: water quanty, Land use, Aemous ensing, "Virginia, "Monitoring, Reservoirs, Watersheds(Basins), Land management, Land classification, On-site investigations, Water sampling, Surface waters, Census, Turbidity, Secchi pling, Surface waters, Census, Turbuity, Sectin disks, Satellites(Artificial), Spatial distribution, Data processing, Analytical techniques. Identifiers: LANDSAT, Pixels.

In a joint project with the Virginia State Water Control Board and NASA, water quality monitor-ing possibilities from LANDSAT were demonstrated, both for direct readings of reflectances from the water and for indirect monitoring of changes in use of land surrounding Swift Creek Reservoir. Film products were shown to have insufficient resolution, and all work was done by digitally processing computer-compatible tapes. Perhaps the greatest potential contribution of LANDSAT is through indirect interpretation, by detecting changes in land cover in a watershed. Land cover maps of the 18,000 hectare Swift Creek Reservoir watershed were prepared for two dates in 1974. A significant decrease in the pine cover was observed in a 740 hectare construction site within the watershed. A measure of the accuracy of classification was obtained by comparing the LANDSAT results with visual classification at five sites on a U-2 photograph. Such changes in land cover can alert personnel to watch for potential changes in water quality. (See also W77-08408) (Humphreys - ISWS) W77-08432

THE LANDSAT-1 MULTISPECTRAL SCANNER AS A TOOL IN THE CLASSIFICATION OF IN-

National Eutrophication Survey, Corvallis, Oreg. D. H. P. Boland, and R. J. Blackwell.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 419-442, September 1975. 13 fig, 3 tab, 11 ref.

Descriptors: *Classification, *Lakes, *Water quality, *Remote sensing, *Minnesota, *Michigan, *New York, *Wisconsin, Surface waters, Eutrophication, Trophic level, Data processing, Monitoring, Surveys, Analytical techniques, Satellites(Artificial), Phosphorous, Chlorophyll, Nitrogen, Conductivity. Identifiers: LANDSAT.

This study focused on relationships between LANDSAT-1 multispectral scanner (MSS) data and the trophic status of a group of lakes located in the north-northeastern part of the United States. MSS data were used to predict the magnitudes of two trophic state indicators, to estimate lake position on a multivariate trophic scale, and to automatically classify lakes according to their trophic state. Initially, principal component ordiantion was employed to ascertain the trophic state of 100 lakes using the indicators: chlorophyll a, conductivity, inverse of Secchi transparency, total phosphorus, total organic nitrogen, and produc-tivity as measured by a standard algal assay yield test. The resultant PCl values were indicative of the lakes' positions on a multivariate trophic scale.

MSS data for some 20 lakes were extracted from
computer-compatible tapes (CCT's) using a binary marking technique. Output was in the form of descriptive statistics and photographic concatena-tions. MSS color ratios were incorporated into regression models for the prediction of Secchi disc transparency, chlorophyll a, and lake position on the trophic scale. Lake trophic state-MSS relationships were also examined using three-dimensional color ratio models. Automatic image processing techniques were used in conjunction with MSS data and trophic state index values to classify each

lake pixel-by-pixel. Classification products included both gray scale and color-coded photographic prints. It appears that the LANDSAT-1 MSS has the capability of providing supplemental data relating to water quality in inland lakes. Further refinement in the sensor and the data processing techniques should make multispectral imagery collected from space platforms a valued tool in lake survey and monitoring activities (See tool in lake survey and monitoring activities. (See also W77-08408) (Humphreys - ISWS) W77-08433

TROPHIC STATUS OF INLAND LAKES FROM

Wisconsin Univ., Madison, Inst. for Environmen-

tal Studies.
L. T. Fisher, and F. L. Scarpace.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM-X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 443-450, September 1975. 3 fig, 1 tab, 2 ref.

Descriptors: *Lakes, *Water quality, *Wisconsin, *Remote sensing, *Data processing, Analytical techniques, Data storage and retrieval, Costs, Surface waters, Trophic level, Eutrophication, Satellites(Artificial).

Identifiers: LANDSAT.

A cooperative program involving university researchers and natural resource managers utilized LANDSAT data to produce an economical trophic status assessment of 3,000 Wisconsin lakes. Computer programs were developed which allow easy, rapid access to LANDSAT data and which can be used by non-research personnel for production data extraction. Capital expenses were low, and operating costs were very reasonable compared to expenses to acquire on-site data of comparable quality. (See also W77-08408) (Humphreys-ISWS) W77-08434

THE USE OF LANDSAT-1 IMAGERY FOR WATER QUALITY STUDIES IN SOUTHERN SCANDINAVIA,

Lund Univ., (Sweden). Dept. of Physical Geography. U. Hellden.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975. Houston, Texas, p 451-468, September 1975. 12 fig, 15 ref.

Descriptors: *Lakes, *Water quality, *Remote sensing, *Foreign countries, Surface waters, Water pollution, Satellites(Artificial), Data processing, Analytical techniques, Instrumentation.

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Identifiers: *Sweden, LANDSAT, Densitometer.

In order to find out the possibilities of using LANDSAT-1 images for environmental studies, with special references to water quality studies, test areas in southern Scandinavia were selected. The MSS images of different bands were compared under the magnification of an In-terpretoscope, and densitometric analyses were performed in a Schnellphotometer. The possibility of tracing pollution plumes was studied in the Oresund outs de Copenhagen. The effect of different sewers and the circulation of the polluted water was analyzed in various situations. The variation in reflectivity of a great number of lakes in South and Middle Sweden was studied by means of densitometric analyses, and significant regional differences were found. The correlation with with in situ measurements of water quality of the sampled lakes was fairly good. (See also W77-08408) (Humphreys-ISWS) W77-08435 REMOTE SENSING APPLICATIONS IN THE INVENTORY AND ANALYSIS OF ENVIRON-MENTAL PROBLEMS, Environmental Protection Agency, Warrenton, Va. Environmental Photographic Interpretation

C. E. Howard, Jr., and C. A. Waters, Jr.
In: Proceedings of the NASA Earth Resources
Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 585-598, September 1975, 10 fig.

Descriptors: *Monitoring, *Environment, *Remote sensing, *Census, Water pollution sources, Air pollution, Feed lots, Landfills, Projects, Satellites(Artificial), Aerial photography, Environmental effects.
Identifiers: LANDSAT, Skylab.

The Environmental Protection Agency, through the Environmental Photographic Interpretation Center (EPIC), is actively engaged in the extrac-tion of environmentally related data from both high resolution and multispectral imaging systems. From its inception, the EPIC has researched the various sensing systems available from both a cost effective and information content standpoint. Through interagency agreements and cooperative programs such as the NASA Aircraft Support Proram, imagery has been acquired in areas where EPA has operational requirements. Presently, the efforts of EPIC are directed toward the inventory and analysis of many types of pollution sources, both point and non-point. To date (1975), in its brief 1 1/2 year existence, EPIC has found that the nature of its requirements has almost exclusively demanded the use of high resolution photography. (See also W77-08408) (Humphreys-ISWS) W77-08438

SOME EXPERIMENTAL DATA ON THE STUDY OF THE BIOLOGICAL ACTION OF ETHYLBUTYLAMINE AS A WATER POLLU-

THON FACTOR, (IN RUSSIAN), Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR). Div. of Public Hygiene. S. A. Zyabbarova, M. N. Kuklina, and L. E. Yakovleva. Gig Sanit. 3, p 106-107, 1974.

Descriptors: *Water pollution, Organic com-pounds, Biology, *Lethal limit, *Water quality standards, *Pollutant identification. Identifiers: *Ethylbutylamine.

Standardization of ethylbutylamine (EBA) in water bodies was attempted to study its biologic action. EBA is a colorless transparent liquid. It boils at 108 C, has a molecular weight of 101.99, a specific weight of 0.7391, and is soluble in water. It can enter water bodies as a component of sewage water and affects the organoleptic qualities of water (e.g., its smell and taste). Its biological action was studied on white rats and mice. LD50 is 273.2-347 mg/kg for rats, and 315.1-514.3 mg/kg for white mice. EBA doses of 0.02, 0.3, and 6 mg/kg were used for 6 mo. Blood tests did not show any changes. Tests on sacrificed animals were more sensitive, indicating a decrease of vitamin C content in the liver for 6 mg/kg EBA. For 3 mg/kg EBA, adrenal glands' weight coeffi-cient increased, while spleen weight coefficient decreased. The adrenal glands weight coefficient in animals given 6 mg/kg was similar to the one in the control group, while the decrease observed in the spleen weight coefficient was statistically unreliable. Histological studies did not show intoxication in internal organs. A 0.5 mg/l (0.025 mg/kg) concentration of EBA in water has no toxic effect. The 0.5 mg/l EBA concentration in water bodies is recommended as the allowed level.—Copyright 1975, Biological Abstracts, Inc. W77-08439 INVERTEBRATE COLONIZATION OF ARTIFI-CIAL SUBSTRATES IN SAN LEANDRO CREEK,
California Univ., Berkeley. Dept. of Forestry and

Conservation.

R. B. KODY.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 067, Price codes: A04 in paper copy, A01 in microfiche.

Master of Science Thesis, (1976). 63 p, 14 fig, 8 tab, 52 ref. (California Water Resources Center Project UCAL-WRC-W-411). OWRT-A-047-CAL(1).

Descriptors: *Invertebrates, *Artificial substrates, *Benthic fauna, Water quality, *California, *Bioindicators, Sampling, Monitoring, Variability, *Instrumentation, Pollutant identification. Identifiers: *San Leandro Creek(Calif), Berkeley area(Calif)

In recent years much attention has been given to the use of artificial substrates for sampling benthic communities. The major impetus for their increased use comes from the Environmental Protection Agency's use of artificial substrates in water quality monitoring. The general consensus of workers who have used artificial substrates is that they possess advantages not found in more traditional benthic sampling methods. Uniform habitat and surface area, reduced sampling time and difficulty are among the quoted attributes of artificial substrates. After one summer of mixed results, it was decided to scrutinize the effectiveness of the sampler. A small stream comparable to others sampled during the project was chosen near the Berkeley Campus. The objective was to investigate the factors affecting the performance of the sampler. Specifically, information concerning the colonization time and identification of factors causing variability was acquired, and some tentative evaluations were attempted. (Snyder-California, Davis) W77-08443

SPECTROANALYTICAL PARAMETERS OF FUNGAL METABOLITES: OOSPOREIN AND

DESMETHOXYVIRIDIOL, Auburn Univ., Ala. Dept. of Chemistry. For primary bibliographic entry see Field 2K. W77-08449

THE EUTAW-MCSHAN AQUIFER IN MISSIS-

Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08466

DISSOLVED SOLIDS, HARDNESS, AND ORTHOPHOSPHATE OF SURFACE-WATER RUNOFF IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT, Geological Survey, Tallahassee, Fla.

Resources Div. For primary bibliographic entry see Field 7C. W77-08467

WATER-RESOURCES INVESTIGATIONS IN SOUTH DAKOTA, 1976. Geological Survey, Huron, S.D. Water Resources

For primary bibliographic entry see Field 7C.

W77-08468 MAPS SHOWING GROUND-WATER CONDI-

TIONS IN THE PUERCO-ZUNI AREA, APACHE
AND NAVAJO COUNTIES, ARIZONA--1975,
Geological Survey, Flagstaff, Ariz. Water For primary bibliographic entry see Field 7C. W77-08471

Group 5A-Identification Of Pollutants

WATER RESOURCES DATA FOR CONNEC-Geological Survey, Hartford, Conn. Water Resources Div. For primary bibliographic entry see Field 7C.

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1974-75 WATER

Geological Survey, Austin, Tex. Water Resources Div.

J. Rawson, and E. S. Chitwood.

Texas Water Development Board, Austin, 1977. 169 p, 18 fig, 84 tab, 13 ref.

Descriptors: *Water quality, *Reservoirs, *Texas, Water analysis, Chemical analysis, Dissolved solids, Dissolved oxygen, Hydrogen ion concentration, Water temperature.

Periodically since October 1961, the U.S. Geological Survey, in cooperation with State, Federal, and local agencies, has made comprehensive water-quality surveys of selected reservoirs in Texas. During the 1970 water year, the program was expanded to include periodic sampling of many other reservoirs in the State where waterquality surveys were not made. Water-quality data published previously. This report contains the results of water-quality surveys of 17 reservoirs and chemical analyses of samples collected periodically from 58 reservoirs. (Woodard-USGS) W77-08483 collected before October 1973 have been

WATER RESOURCES DATA FOR NEW YORK. WATER YEAR 1975.

Geological Survey, Albany, N.Y. Water Resources Div. For primary bibliographic entry see Field 7C. W77-08485

THE MATHEMATICAL DESCRIPTION OF THE BOD REACTION IN STREAM WATER, Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science. For primary bibliographic entry see Field 5B. W77-08493

A COMPARISON OF THE METHODS FOR CALCULATING THE CONSTANTS FOR THE FIRST ORDER BOD EQUATION, Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.

For primary bibliographic entry see Field 5B. W77-08494

DESIGN OF A WATER QUALITY MONITOR-ING NETWORK, North Carolina Univ. at Chapel Hill. Dept. of En-

vironmental Sciences and Engineering. R. A. Berndt.

Available from the National Technical Informa-Translation Terrational Technical Information Service, Springfield, VA 22161 as PB-268 520, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 89 p, 13 fig, 14 tab, 17 ref. OWRT A-065-NC(1), 14-31-0001-4033.

*Networks, Water quality, *Monitoring, *Water value standards, *Design criteria, Pollutant Descriptors: quality standards, *Design identification, Water analysis. Identifiers: *Water quality monitoring network.

The aim is to examine the design of a water quality monitoring network for the objective of enforcement of water quality standards. The strategy for monitoring consists of the parameters sampled, the number and location of sampling stations, and the frequency of sampling. Parameters sampled are essentially those included in the water quality standards. Principal component analysis is used to

identify important parameters. Number of sampling stations is dependent on the available resources of the monitoring agency. Priority among the total stations is determined by probability of violation, principal component analysis, nonulating density and graphical technique. Inforpopulation density and graphical technique. Information content and t tests are used to determine frequency of sampling. (Stewart-NC State) W77-08497

BACTERIAL GROWTH ON DISSOLVED OR-GANIC COMPOUNDS IN FRESH-WATER BACTERIAL GROWTH ON DISSOLVED OR-GANIC COMPOUNDS IN FRESH-WATER RESERVOIRS, (IN RUSSIAN), Akademiya Nauk SSSR, Moscow. Institut Biologii

Vnutrennykh Vod.

V. I. Romanenko, and E. P. Nikiforova. Mikrobiologiya 43(1), p 133-137, 1974.

Descriptors: *Bacteria, Organic matter, *Organic compounds, *Pollutant identification, Reservoirs, Filters, *Mycobacterium.

Identifiers: Agar, USSR, Oligocarbophilic bacteria, *Membrane filter technique, *Bacterial growth, *Rybinsk reservoir(USSR).

Water from the Rybinsk reservoir (USSR) filtered through an asbestos filter, was used as a growth medium for bacteria. The content of dissolved organic substance in the medium was 13.4 mg C/l. Flasks containing 100 ml of the medium were sterilized and inoculated with several drops of water. The absence of bacterial cells in the medium enabled monitoring of the growth of oligocarbophilic bacteria by direct count on membrane fil-ters. The bacterial growth was very intensive in this medium at 20-26C, the generation time was 1-3 h. The bacterial number, calculated by direct count and by counting the number of colonies on MPA meat peptone agar was the same during the intensive growth. Lower amounts of the bacteria were detected after prolonged storage on MPA. The growth rate of mycobacteria was highest in medium.--Copyright 1975, Biological Abstracts, Inc. W77-08498

CRYSTAL STRUCTURE ANALYSIS SELECTED PESTICIDES BY SIN CIDES BY SINGLE DIFFRACTION: THE CRYSTAL X-RAY CRYSTAL AND MOLECULAR STRUCTURE OF

Rhode Island Univ., Kingston. Dept. of Chemis-

F. J. Pickles.

Available from the National Technical Informa-Available 110h the National Technical Information Service, Springfield, VA 22161 as PB-268 579, Price codes: A04 in paper copy, A01 in microfiche. M. S. Thesis, 1975. 46 p, 3 fig, 17 tab, 33 ref. OWRT A-051-RI(2), 14-31-001-5040.

Descriptors: *Pesticides, *Pesticide residues, *Molecular structure, *Crystallography, *Pollutant identification, *X-ray diffraction, In-secticides, Chlorinated hydrocarbon pesticides, *Crystallography, Chemical analysis.

Identifiers: *Padan, Nereistoxin, Chloinergic activity, Structure - activity correlation.

The solution of the crystal and molecular structure of Padan by single crystal X-ray diffraction confirmed that the compound under investigation is 1, 3-bis(thiocarbamoyl)-2-N,N-dimethylaminopropane hydrochloride. The results show that the structure of Padan is very similar to that of acetylcholine. This similarity suggests that the toxicity of this insecticide may be due to its activity in cholinergic systems. W77-08503

THE EFFECT OF SOLUBLE ORGANIC MATTER ON THE UTILIZATION OF PHENOX-Y HERBICIDES BY PSEUDOMONAS SP., Rhode Island Univ., Kingston. Dept. of Microbiology. For primary bibliographic entry see Field 5C. W77-08504

METHOD FOR QUANTITATIVE DETER-MINATION OF AMMONIFYING AND DENITRIFYING BACTERIA IN WATER WITH APPLIED EXAMPLES FROM GRAVEL-PIT POOLS, (IN CZECH),

Slovenska Akademie Vied, Bratis (Czechoslovakia). Limnobiologisches Institut. Bratislava I. Daubner, and R. Ritter.

Int Rev Gesamten Hydrobiol. 57(4), p 517-522,

Descriptors: *Bacteria, *Pollutant identification, Gravel pits. Methodology, Ponds. *Analytical Denitrification, techniques.

*Ammonification.

Identifiers: *Ammonifying bacteria, *Denitrifying bacteria, Gravel pits, *Membrane filter technique.

Using a new and simple membrane filter technique, the determination of ammonifying and denitrifying bacteria in water together with their identification 'in situ' was achieved. The membrane filter (MF) together with the grown bacterial colonies is either put on a paper filter saturated with the reagents or the reagents are applied dropwise to another wet sterile MF laid on top of the original. After 1-2 min the positive (colored) colonies are counted. The method was compared with the 'MPN'-method (most probable number) on different water samples and was applied during 1970 in investigations on gravel-pit pools. This method gives sightly higher bacterial counts than the MPN-method, but only in 1 instance was the difference significant. The method is precise and rapid, thus it is suitable for routine work.--Copyright 1975, Biological Abstracts, Inc. W77-08509

POLLUTION INDICATOR BACTERIA ASSOCIATED WITH MUNICIPAL RAW AND DRINKING WATER SUPPLIES,

Ontario Ministry of the Environment, Rexdale. Lab. Service Branch.

J. A. Clark, and J. E. Pagel. Canadian Journal of Microbiology, Vol. 23, No. 4, p 465-470, April, 1977. 2 tab, 11 ref.

Descriptors: *Bacteria, *Pollutant identification, *Bioindicators, *Potable water, *Municipal water, Analysis, Microorganisms, Analytical techniques, *Public health, Membrane processes, Fermentation, Water supply.

Identifiers: Most probable number technique.

The membrane filter (MF) and presence-absence (P-A) methods were used to determine the relative frequencies of the most commonly isolated pollution indicator bacteria associated with raw and drinking waters. A total of 3819 bacterial cultures were isolated in samples from 55 Ontario municipalities. The cultures were 82% Enterobacteriaceae and 18% oxidase-positive organisms. The Enterobacteriaceae were 92% lactose fermenters; 59% of these were aerogenic at 35 C and 14% at 44.5 C. Seventy-six percent of the oxidase-positive organisms were negative for lactose fermenta-tion. About 1% of the lactose-fermenting cultures were aerogenic and oxidase-positive at 35 C. Frequency distributions were similar for both raw and drinking water isolations, but Escherichia doubled their frequency in raw water. Klebsiella organisms were preferentially cultured from MF ites and Enterobacter were isolated about twice as frequently as other coliform genera studied. The MF technique would not detect non-lactose fermenting coliform colonies, but this could be offset by the Aeromonas colonies. Coliform isolates would be undetected by the MPN technique because at least 25% were either anaerogenic or non-lactose fermenters. (Collins-FIRL) W77-08516

CONFIRMATION OF THE SINGLE-STEP MEM-BRANE FILTRATION PROCEDURE FOR ESTI- MATING PSEUDOMONAS AERUGINOSA DEN-SITIES IN WATER, Canada Centre for Inland Waters, Burlington (Ontario).

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B. J. Dutka, and K. K. Kwan.
Applied and Environmental Microbiology, Vol.
33, No. 2, p 240-245, February, 1977. 1 fig, 6 tab,

Descriptors: *Analytical techniques, *Filtration, *Membranes, *Pseudomonas, Performance, *Bacteria, Coliforms, Separation techniques, Analysis, Waste water treatment, *Bioindicators, Pollutant identification, Pathogenic bacteria. Identifiers: Brodsky-Nixon MacConkey agarmembrane filtration, Most-probablemembrane number(MPN)

Pseudomonas aeruginosa concentrations in water have become recognized as an indicator of pollu-tion and as a pathogen. Determination procedures tion and as a pathogen. Determination procedures have been developed including membrane filtration and most-probable-number (MPN). Two membrane filter processes and MPN were compared to determine their relative efficiencies in enumerating P. aeruginosa from Canadian water and sewage samples. The Brodsky-Nixon MacConkey agar-membrane filtration procedure was a 24-hour procedure using a commercially available medium. Density estimates were based on the presence of fluorescence. It was found that large residence of inderescence. It was found that large coliform populations interfered with the develop-ment of P. aeruginosa colonies. The method was judged unsuitable for application to natural and ef-fluent waters. The other membrane filter process employed proline and ethanol. Results indicated that the specificity of membrane filter procedures confirmed 92-99% of the organisms as P. aeru-ginosa, while MPN verification rates varied from 64 to 86%. For all but sewage samples, a 3-4 day incubation period at 41.5 C provides the best data results with membrane filtration. This procedure, with mPA or mPA medium B, is a simple and rapid technique which avoids the extended procedures necessitated by the MPN technique. (Collins-W77-08518

ENTEROVIRUS TYPES IN ISRAEL SEWAGE, Hadassah Medical School, Jerusalem (Israel). B. Fattal, and M. Nishmi. Water Research, Vol. 11, No. 4, p 393-396, 1977. 1 fig, 2 tab, 16 ref. EPA S-800990.

Descriptors: *Viruses, *Pollutant identification, *Analytical techniques, Public health, Diseases, Microorganisms, Analysis, Microbiology, Water pollution sources, Waste water treatment, Sewers, Enteric bacteria. Identifiers: *Israel.

Picked virus and neutralization test methods were described for the isolation and identification of en-teroviruses in the sewage of various Israeli com-munities. Grab and gauze pad methods were used munities. Grab and gauze pad methods were used to collect the sewage samples. The first method resulted in the finding of 489 isolates. These included 74% polioviruses; 10% Coxsackie Type B, Coxsackie A9 or Echo 9; and 16% Echo and other strains of enteroviruses. Fifty-two samples were tested for polio and non-polio viruses with the neutralization method. An average of 37% were found to be polioviruses. These executives were neutralization method. An average of 37% ere found to be polioviruses. These percentages were higher than those obtained with other test methods. Regular virus monitoring of sewage would give a qualitative view of the enteroviruses in sewage and of the prevalence of enteroviral diseases of the population. (Collins-FIRL) W77-08519

RAPID AGAR POUR-PLATE TECHNIQUE FOR DETECTION AND ENUMERATION OF FAE-CAL COLIFORMS IN SEWAGE, National Environmental Engineering Research

Inst., Nagpur (India). P. M. Phirke.

Indian Journal of Environmental Health, Vol. 18, No. 3, p 183-190, July, 1976. 4 tab, 16 ref.

Descriptors: *Analytical techniques, *Pollutant identification, *Coliforms, Pollutants, Sewage treatment, Waste water treatment, Analysis, *Bacteria, Sewage effluents, Water pollution con-

Identifiers: Most-probable-number(MPN), Rapid agar pour-plate method.

The rapid agar pour-plate technique was developed to estimate coliform populations in sewage. The technique involved the homogenization of sewage samples which were then mixed with a sterile saline solution. Appropriate dilutions were placed in separate sterile petri dishes. Rapid agar, melted and cooled to 50-55 C, was added to the petri dishes and thorough mixing followed. Incubation at 41.5 C + 0.5 C in a water-jacketed air incubator for 7 to 8 hours followed solidification of the medium. After incubation, the yellow or orange coliform colonies were counted with a Qubec colony counter. Necessary computations were then made to adjust the results for tabulation. The technique was found to be quite sensitive and The technique was found to be quite sensitive and reliable. Results were consistent and reproducible with a 12.63% to 12.93% coefficient of variation. A specificity for fecal coliforms was a prime characteristic of this technique and comparisons with the MPN procedure revealed no significant differences. This method has the advantage of yielding absolute numbers as test results. (Collins-FIRI.) W77-08520

IMPROVED METHOD FOR THE DETERMINA-TION OF ETHYLENEDIAMINETETRAACETIC ACID IN AQUEOUS ENVIRONMENTAL SAM-PLES BY GAS-LIQUID CHROMATOGRAPHY, Pollution Research Lab., Stevenage Water (England).

J. Gardiner. The Analyst, Vol. 102, No. 1211, p 120-123, February, 1977. 1 fig, 2 tab, 3 ref.

*Analytical techniques. Descriptors: *Chromatography, *Chemical reactions, **Chemical reactions, **Pollutant identification, Liquid wastes, Sewage treatment, Waste water treatment, Laboratory tests, Analysis, Water purification, **Organic acids, Gas Chromatography.

Identifiers: **Ethylenediaminetraacetic acid.

The determination of ethylenediaaminetetraacetic

acid (EDTA) in sewage, sewage effluents, and rivers is important because EDTA might lower the effect of adsorption and precipitation reactions in removing trace metal contaminants. Colorimetric and complexomtric analytical methods were un-successful; gas-liquid chromatography dterminations presented problems. A method was proposed using 1,6-hexanediaminetetraacetic acid (HDTA) as an internal standard. The sample is filtered and the filtrate is extracted with chloroform; it is then acidified with formic acid and the HDTA is added. After evaporation, but before precipitation, the fil-trate is rinsed and further evaporated under a stream of nitrogen and in an oven. The tube is drawn in the middle in a gas-oxygen flame, and an esterifying solution is added. The tube is sealed, placed in boiling water, and centrifuged in a tube containing a phosphate buffer solution. After separation, the chloroform layer is transferred to a small sample tube and evaporated in the solvent under a nitrogen stream. The residue is dissolved in acetone and injected on to the gas-liquid chromatographic column. The mean recovery for this method is 98.6% with a 13.1% standard deviation. (Collins-FIRL)

CHLOROBIPHENYLS AND PCB'S: FORMA-TION DURING CHLORINATION, Georgia State Univ., Atlanta. Dept. of Biology.

W77-08521

Journal Water Pollution Control Federation, Vol. 49, No. 3, p 401-404, March, 1977. 3 tab, 14 ref.

Descriptors: *Chlorination, *Disinfection, *Polychlorinated biphenyls, Municipal wastes, Industrial wastes, Treatment facilities, Toxicity, Chemical reactions, Analytical techniques, Chromatography, *Waste water treatment.

Identifiers: *Chlorobiphenyls.

A study was conducted to discover if chlorobiphenyls were produced during actual and laboratory simulation of water and waste water treatment plant operation. Samples were spiked with biphenyl and chlorinated, extracted with hexwith hiphenyl and chlorinated, extracted with hex-ane, and analyzed by gas chromatography. Results showed that various chlorobiphenyl isomers were produced during final chlorination. These and other organochlorines were produced in the laboratory chlorination of municipal plant influent and effluent. Mono- and dichlorobiphenyl were produced in the absence of iron; more were produced in its presence. Laboratory chlorination slightly increased dichlorobjphenyls concentra-tions in influents, but reduced them in effluents. Studies are being continued on the effect of these compounds on water and waste water treatment, on downstream ecosystems, and on water use. (Collins-FIRL) W77-08538

IMPROVED GALVANIC DISSOLVED OXYGEN SENSOR FOR ACTIVATED SLUDGE, Fischer and Porter Co., Warminster, Pa

R. Poole, and J. Morrow.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 422-428, March, 1977. 7 fig, 9 ref.

Descriptors: *Pollutant identification, *Dissolved oxygen, *Monitoring, *Measurement, Equipment, *Activated sludge, Membranes, Electrolytes, Electrodes, Mechanical engineering, Analysis, *Waste water treatment. Identifiers: Galvanic sensor.

A galvanic dissolved oxygen sensor which uses gold as the cathode and copper as the anode was developed. The gold electrode is covered with a gas-permeable, liquid impermeable teflon membrane to separate the cell from the test solution. The interior chamber has an electrolyte capacity of 60 centimeters. A thermistor is cemented to the sensor body. The sensor can operate continuously for 15 months before recharge is necessary. The membrane is easily replaced in field operation and good temperature compensation results from its exposure to constant load resistance at all tem-peratures. Field tests produced good results in peraintes. Picto tests produced good results in aeration tanks. Agitators are not necessary when the sensor is used in aeration tanks. (Collins-FIRL) W77-08539

DETERMINATION OF BOD AFTER FREEZING WATER SAMPLES (BESTIMMUNG DES BSB NACH EINFRIERUNG DER WASSERPROBEN),

Munchner Beitrage zur Abwasser-, Fischerei- und Flussbiologie, Vol 27, p 179-204, 1977. 12 fig, 9

Descriptors: *Pollutant identification, *Analytical techniques, *Freezing, *Biochemical oxygen demand, Bacteria, Flocculations, Temperature, Chemical oxygen demand, Organic matter, Carbon, *Waste water treatment, Chemical proper-

The effect of freezing and storing waste water samples on their biochemical and chemical parameters was studied. Waste water samples that parameters was studied. Waste water samples that cannot be analyzed on the site should be stored deep-frozen at -40 to -70C. Since a high percentage of the bacteria are irreversibly damaged by deep-freezing, samples thawed after such storage should be inoculated with mechanically or biologi-

Group 5A-Identification Of Pollutants

cally purified municipal waste water before BOD measurement. As freezing results in the floccula-tion of additional organic substance that remains in the sample, it is necessary to eliminate the settiting substances before freezing. With a BODS range of 10-50 mg/liter, storage at -20 to -30C can result in BODS losses of up to 20% compared with those of a fresh sample. The loss does not exceed those of a fresh sample. The loss does not exceed 10% in a BOD5 range of 50-2,000 mg/liter. The BOD5, COD and TOC values measured in samples with BOD5 over 2,000 mg/liter, and stored at the above temperature, may be higher than those measured in fresh samples. The chemical and bac-teriological parameters decrease progressively with storage time in the frozen state, especially in samples with low organic matter content, and in samples frozen and stored at relatively high subzero temperatures. (Takacs-FIRL) W77-08546

SUSPENDED SOLIDS MEASUREMENT GIVES IMPROVED CONTROL,

Instruments (H. F.) Ltd., Bolton (Ontario).

E. S. Posgate. Water and Wastes Engineering, Vol. 14, No. 3, p 30, 32, 35-36, March, 1977. 5 fig.

Descriptors: *Measurement, *Monitoring, *Automatic controls, Analysis, Equipment, *Suspended solids, Polymers, Flow rates, Physical properties, Chemical properties, Waste water treatment, Water purification.

Identifiers: Turbidimeters.

Turbidimeters have been adapted for monitoring and control at water and waste water plants. These reduce costs by regulating chemical input to actual demand. The basic process is a combination of gravimetric analysis with linear instruments for direct measurement in ppm of suspended solids. Factors involved in the use of this equipment are the type of water source, upstream discharges to the water source, seasonal climate, and weather changes. There is not a simple answer to what suspensions can be monitored directly. The major factor is that the suspension have uniform characteristics over a long term. Possible applications are moitoring activated sludge concentration and controlling flow rate for return to the primary stage, proportioning polymer input in sludge dewatering, final effluent monitoring, measuring sludge volume index, and making daily suspended solids measurements in advanced treatment systems. The automactic control system can reduce costs. (Collins-FIRL) W77-08568

RELIABLE PH MEASUREMENT WHEN EF-FLUENT CONDITIONS GET TOUGH. Electrofact, Plymouth, Minn.

R. J. Kidder.

Pollution Engineering, Vol 9, No 4, p 30-33, April, 1977. 5 fig.

Descriptors: *Pollutant identification, *Automatic Descriptors: "Poliutant identification, "Automatic controls, "Hydrogen ion concentration, "Measurement, Instrumentation, Electrodes, Electrical properties, Monitoring, Equipment, Treatment facilities, Waste water treatment.

The reliability and use of pH measurement by automated systems was evaluated. Many com-ponents are available, and it was suggested that proper selection would produce a reliable and trouble-free system. Electrical components were listed and their electrical characteristics were briefly described, as were the problems associated with them. The reference electrodes discussed were of two types: diffusion or solid state electrodes, and flowing junction electrodes. Measur-ing electrodes were described and their design criteria were presented. They should be able to tolerate wide pH variations without chemical attack at ambient temperature, be suited to low pH solutions at high temperatues, and they should be constructed to provide suitable operation at low temperatures. Installation problems include unreliable or erroneous readings from common mode or ground loop voltages and fouling by filming or solid deposits. Various solutions were offered for these problems. (Collins-FIRL) W77-08592

5B. Sources Of Pollution

IRRIGATED AGRICULTURE: NONPOINT AND POINT SOURCE WATER POLLUTION. For primary bibliographic entry see Field 5G. W77-08116

WATER RESOURCES OF LIMESTONES FRANCHE-COMTE: PROBLEMS OF QUANTITY AND QUALITY, (IN FRENCH), For primary bibliographic entry see Field 4B.

SUMMARY OF SOME CURRENT AND POSSI-BLE FUTURE ENVIRONMENTAL PROBLEMS RELATED TO GEOLOGY AND HYDROLOGY AT MEMPHIS, TENNESSEE,

Geological Survey, Nashville, Tenn. Water Resources Div.

For primary bibliographic entry see Field 4C. W77-08174

DRIFT VELOCITIES OF SURFACE FILMS OVER WAVES

Connecticut Univ., Storrs. Inst. of Water Resources.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 661, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, 1977. 95 p, 35 fig, 10 tab, 1 append, 25 ref. OWRT A-059-CONN(1), 14-31-0001-5007.

Descriptors: *Oil spills, *Oil-water interfaces, *Waves(Water), *Films, *Wind velocity, *Waves(Water), *Films, *Wind *Turbulent boundary layers, Oil pollution, Laboratory tests, Path of pollutants.

Identifiers: *Oil slicks, *Drift velocities, *Wind-generated waves, *Mechanically-generated waves, *Wave steepness, *Surface film convection, *Stokes waves, Laboratory wind-wave channel, Pollution control operations, Estuaries,

Oil spillage into the marine environment has become a serious problem in recent years. The analysis of the convection of an oil slick under oceanic conditions is an essential tool for pollution control operations. The drift of an oil slick on the sea is under the influence of both wind and waves. Research was initiated to study the convection of a surface film under the action of wind- and mechanically-generated waves in a laboratory wind-wave channel by using polyethylene sheets. In order to simulate the drift of an oil slick in a laboratory channel, the film size should be greater than two wavelengths for the wind-waves and one wavelength for mechanically-generated waves. The drift velocity over wind-waves is a function of wind velocity and wave steepness. However, the ratio of drift velocity to the shear velocity of the turbulent air boundary layer was found to corre-late uniquely with the wave steepness for sufficiently large wave steepness. For the mechani-cally-generated waves, the film drift velocity is larger than the surface particle drift of the Stokes waves. In a wave field characterized by wave steepness, the effect of the wind on the drift velocity of surface films predominates over that due to waves. (de Lara-Connecticut) W77-08193

THE EFFECT OF AERATION OF WATER JET SPREADING, Connecticut Univ., Storrs. Inst. of Water

For primary bibliographic entry see Field 8B. W77-08197

THE INFLUENCE OF PRECIPITATION ON BIOCHEMICAL OXYGEN DEMAND ON NINE STREAMS IN NEW JERSEY, Rutgers - The State Univ., New Brunswick, N.J.

Dept. of Geography. D. V. Dunlap.

Available from the National Technical Informarounding from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267 724, Price codes: A07 in paper copy, A01 in microfiche, Ph.D. Dissertation, January 1976, 114 p, 6 fig, 11 tab, 62 ref, 4 append. OWRT A-025-NJ(11). 14-31-

Descriptors: *Biochemical oxygen demand, *New *Precipitation(Atmospheric), *Streams, Jersey, *Streamflow, Temperature, Spatial distribution, Temporal distribution, *Air temperature.

The influence of precipitation, streamflow and temperature on biochemical oxygen demand (BOD) on nine streams in central and northern New Jersey is examined with the goal of determin-ing the time factors and spatial distribution of BOD as influenced by precipitation. From August 1969 to March 1972, 530 samples were taken with simultaneous observations of BOD concentration, streamflow, and air temperature (as an approximation to water temperature), along with precipitation for various time periods prior to observation time. Sites were chosen in sandy and clay soils, and for each soil texture there was a wooded area. a farm area and a residential area. Most of the watersheds covered areas of less than 11 square miles, but one was a river basin of 258 square miles. Stepwise regression techniques were applied to the data using precipitation intervals ranging from 1 to 24 hours duration. Short-term intervals of precipitation from 1 to 6 hrs, were the most effective time periods for the regression equations. Streamflow and BOD concentrations were both so closely related to BOD load that they were dropped from the models. Air temperature seemed to have little effect on the response of BOD load. Bivariate linear regression was undertaken to determine if any direct relationship might exist between BOD load and various periods of antecedent precipitation. Precipitation in the 6 to 12 hours prior to observation time appears to be most closely related to BOD load in the 4 watersheds with the most observations. Significant seasonal differences were manifested. The correlation of streamflow and BOD load was found to be statistically significant on 5 of the streams investigated, with major differences between different streams. W77-08203

MINERAL CYCLING IN RESERVOIRS. Oklahoma State Univ., Stillwater. Dept. of Zoolo-

gy. For primary bibliographic entry see Field 5C. W77-08217

ERIE INTERNATIONAL MODEL FEASIBILITY INVESTIGATION, THE WIND-DRIVEN CURRENTS AND CONTAMI-ANT DISPERSION IN THE NEAR-SHORE OF LARGE LAKES, Case Western Reserve Univ., Cleveland, Ohio.

Dept. of Earth Sciences. Y-Y. P. Sheng.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 tion Service, Springheid, VA 22161 as AD-A017 694, Price codes: A10 in paper copy, A01 in microfiche. Army Engineer Waterways Experi-ment Station, Vicksburg, Mississippi, Contract Report H-75-1, Report 17-5, October 1975. 215 p, 95 fig. 46 ref, 7 append. Army DACW39-74-C-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution-Group 5B

Descriptors: *Water circulation, *Winds, *Lake Erie, *Model studies, Lakes, Mathematical models, Currents(Water), Circulation, Pollutants, Effects, Water pollution, Dispersion, Path of pol-lutants, Suspended solids, Airports, Islands, Hydrodynamics. lutants, Suspended solids, Airports, Islands Hydrodynamics. Identifiers: Wind-driven currents, Jetport effects.

The wind-driven circulation and dispersion of con-taminants in a near-shore region of Lake Erie were studied by means of numerical models. The first problem studied was that of the thickness of the coastal boundary layer in a large lake. In this study, the non-linear acceleration and Coriolis force terms were included in the equations of motion. Next, a major study of the steady-state and time-dependent currents in the near-shore Cleve-land area of Lake Erie, under present conditions and as modified by large man-made structures or islands, e.g., a jetport in the lake, was made. The effects of (1) a jetport island approximately 6 miles offshore of Cleveland, and (2) a land-fill extension of this island to about the same as a second of the same as a of this island to shore, were examined in detail. The island was found not to affect the flow appreciably, while the extension to the shore modified the flow significantly. The calculations generally required a fine near-shore grid coupled with a coarser off-shore grid. In time-dependent calculations, a small time step was used in the near-shore, while a larger one was used in the offshore. The proper coupling procedure was studied in detail. The three-dimensional, time-dependent dispersion equation has been solved for various conditions. A vertically stretched coordinate system was used to incorporate the variable bot-tom topography. The flow and dispersion of a con-taminant from a point source (the Cuyahoga River) in the near-shore were studied, using the velocities obtained from the numerical hydrodynamic models. Effects of horizontal diffusion, gravitational settling, and bottom boundary conditions were examined. With some modification, the nu-merical models developed in this report can be applied to study the near-shore regions of other large lakes and the Ocean. (Sims-ISWS) W77-08220

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A PREDICTIVE MODEL FOR TRANSIENT TEMPERATURE DISTRIBUTIONS IN UN-STEADY FLOWS.

Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics. D. R. F. Harleman, D. N. Brocard, and T. O.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-244 922, Price codes: A06 in paper copy, A01 in microfiche. Report 175, November 1973, 103 p, 29 fig, 4 tab, 4 ref, 1 append. EPA R800429.

Descriptors: *Path of pollutants, *Water tempera-ture, *Unsteady flow, *Model studies, Mathemati-cal models, Water quality, Temperature, Distributon patterns, Powerplants, Nuclear powerplants, Hydroelectric plants, Heat, Heated water, Cooling water, Reservoirs, Estuaries, Water pollution, "Thermal pollution, Flow, Heat transfer, Discharge(Water), Pollution, "Pennsylvania, "Maryland.

Identifiers: *Temperature
*Conowingo Reservoir(Penn-Md). distribution,

The factors contributing to the heat exchange across the free surface of a body of water were reviewed, and quantitative relationships for the calculation of the heat fluxes were summarized. Mathematical models were described which deter-mine the temperature distribution in natural bodies of water. A one dimensional steady model in which the temperature distribution is a function of longitudinal distance was used to show that, when to longitudinal distance was used to show that, when the longitudinal variation of water temperatures is small (up to 10 F), the influence of the water sur-face temperature variation on the widely used sur-face heat transfer coefficient can be neglected.

Another mode was a one dimensional unsteady model in which the temperature distribution is a function of longitudinal distance and time. The flow was unsteady and non-uniform, and meteorological conditions and boundary conditions were compared with measurements of natural water temperatures in Conowingo Reservoir during various periods of time in April and September 1972. (Sims-ISWS) W77-08221

NITROGEN AND PHOSPHORUS ANALYSES OF RAINFALL AT ROTORUA, NEW ZEA-

Marine Dept., Rotorua (New Zealand). Fisheries For primary bibliographic entry see Field 5A. W77-08242

THE FALLOUT OF NITROGEN AND PHOSPHORUS COMPOUNDS FROM THE AT-MOSPHERE AT NGAPUNA, NEAR ROTORUA, NEW ZEALAND, Marine Dept., Rotorua (New Zealand). Fisheries

For primary bibliographic entry see Field 5A. W77-08243

SANITARY AND HYGIENIC CHARAC-TERISTICS OF SUBSURFACE WATERS OF THE TSELINOGRAD AND TURGAI OBLASTS, (IN RUSSIAN), Tselinogradskii Meditsinskii Institut (USSR).

Dept. of General Hygiene. N. I. Anan'ev.

Gig Sanit. 4, p 206-208, 1974.

Descriptors: Public health, Subsurface waters, *Groundwater, *Aquifers, Mineralogy, *Iron, *Fluoride, Artesian waters, Desalination, Water purification, Potable, Waste water treatment. Identifiers: Oblasts, Tselinograd, Turgai, USSR.

In chemical composition the groundwaters of the Tselinograd and Turgai districts in the Kazakh SSR, USSR, are distinguished by considerable diversity even in the same aquifer and after by high mineralization. A relatively high Fe content and low F content was noted in the water of almost all aquifers. The alluvial infiltration waters or river valleys, having low mineralization, good discharge and sufficient supplies, are most promising for supplying populated areas. Because of their stagnant nature and high mineralization, the artesian waters are unsuitable for drinking, but can be used after distillation plants.--Copyright 1975, Biologi-cal Abstracts, Inc. W77-08253

METHOD OF DISPERSING OIL IN WATER, Imperial Chemical Industries Ltd., London (England), (Assignee).
For primary bibliographic entry see Field 5G. W77-08260

THE ACCUMULATION AND DISTRIBUTION THE ACCUMULATION AND DISTRIBUTION OF ORGANOCHLORINES AND SOME HEAVY METALS IN AMERICAN FALLS RESERVOIR FISHES, WATER AND SEDIMENT, Idaho State Univ., Pocatello. Dept. of Zoology.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 914, Price codes: A05 in paper copy, A01 in microfiche.

M.S. Thesis, 1976. 79 p, 6 fig, 8 tab, 102 ref.

OWRT A-043-IDA(1), 14-34-0001-6013.

Descriptors: Reservoirs, Sediments, *Chlorinated *Polychlorinated biphenyls, *Mercury, Water pol-lution, *Cadmium, Metals, Fish, *Idaho, *Heavy metals, Distribution, Path of pollutants, *Pesticide residues, Lethal limit. Identifiers: *American Falls Reservoir(Idaho), *Organochlorines.

Chlorinated hydrocarbon residues (DDT metabolites, dieldrin, and PCB's) were found in fish flesh samples and sediment in American Falls Reservoir. The concentration and type of chlorinated hydrocarbon varied with fish species and age. The mean value for PCB's in large suckers was 671/ug/kg. The Environmental Protection Agency has recommended PCB concentrations in any sample consumed by any bird or mammal be no greater than 500 ug/kg. Chlorinated hydrocarbons were not detected in the water samples. Mercury and cadmium were found in all spe-cies analyzed for those particular metals. Results indicate that the Food and Drug Administration's standard of 0.5 mg/kg may be exceeded in crappie, suckers, and large rainbow trout. The mean value for mercury in water was 0.9 ug/1. The Environmental Protection Agency has recommended for the protection of fish and predatory aquatic organisms, that total mercury concentration in unfilisms, that total mercury concentration in unit-tered water should not exceed 0.2 ug/l at any time or place. The World Health Organization has recommended daily intake of cadmium not be more than 70 ug/day. Consumption of fishes from the reservoir would exceed the recommended limit. The maximum concentration of cadmium in the water was seven times the value given by the National Academy of Sciences, considered to be an environmental threat. Arsenic was found only in the sediments and water. It was not detected in any of the fishes sampled. W77-08287

A QUANTITATIVE STUDY OF ORGANIC CAR-BON DECOMPOSITION AND NITROGEN TRANSFORMATIONS IN SEWAGE SLUDGE-

SOIL SYSTEMS, Rutger - The State Univ., New Brunswick, N. J.

Dept. of Soils and Crops. Y. P. Hsieh.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 924, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Thesis, May 1976, 168 p, 29 fig, 17 tab, 130 ref. OWRT A-038-N.J.(2), 14-31-0001-5030.

Descriptors: *Sewage disposal, Soil water, *Decomposing organic matter, *Waste disposal, Computer models, Carbon, *Carbon dioxide, Sewage sludge, Ammonium, *Nitrates, Temperature, Soil moisture, Nitrogen, *Soil contamination. Identifiers: *Organic carbon.

A quantitative study of rate of sewage sludge decomposition in soil was made, with emphasis on the effect of soil moisture content and soil temperature on rate of release of CO2, NH4 and NO3. Sewage sludge was found to contain two families of organic compounds, one group which decom-posed rapidly and one group that resisted decom-position. The half life of sewage sludge in soil was found to vary with the amount of sewage sludge added to soil. A model describing the decomposition of sewage sludge in soil was prepared. W77-08291

THE INFLUENCE OF BRACKISH-WATER INTRUSION ON MACROINVERTEBRATE ASSOCIATIONS OF THE LOWER TCHEFUNCTE RIVER, LOUISIANA, New Orleans Univ., La. Dept. of Biological

M. M. Munno. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267 933, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, August 1975. 99 p, 1 fig, 13 tab, 65 ref. OWRT A-038-LA(1).

Descriptors: Estuarine environment, Chemical analysis, *Invertebrates, Bioindicators, *Brackish water, *Louisiana, Lakes, Surveys, Ecology, *Saline water intrusion, Water pollution.

Group 5B-Sources Of Pollution

Identifiers: Lake Pontchartrain(La), Estuarine pollution, *Tchefuncte River(La).

An ecological survey was conducted of the lower Tchefuncte River, Louisiana, June-November 1974. The Tchefuncte drains into Lake Pontchartrain, a large oligohaline estuary. Brackish lake water enters the river channel when flow is minimal. Maximum extent of brackish-water intru-sion was determined as approximately 9 miles from the river mouth during October. Eighty-six macroinvertebrate taxa were collected in the study area, 17 marine and 69 predominantly fresh-water. Balanus improvisus, Victorella pavida, Rithropanopeus harrisii, Gammarus sp., Melita nitida, and an unidentified polyclad flatworm existed at the river mouth in limnetic conditions and colonized upriver habitats during maximum brackish-water intrusion when salinity reached approximately 0.79 ppt in these areas. These organisms are proposed as short-term indicators of the extent of brackish-water intrusion. Rangia cuneata, Congeria leucophaeta, and Cordylophora caspia existed under limnetic conditions only in the tidal area of the river. Since these organisms appear dependent upon brackish water for their continued existence in the river, they are proposed as long-term indicators of the extent of brackishwater intrusion. Physicochemical parameters measured included salinity, specific conductance, chlorides, turbidity, color, settleable matter, PH, phenolphthalein alkalinity, total alkalinity, free carbon dioxide, dissolved oxygen, total hardness, sulfate, ammonium nitrogen, nitrate nitrogen, orthophosphate, and total iron. These parameters are discussed in relation to seasonal trends and in relation to similar ones in comparable habitats. W77-08292

BENTHIC MICROBIAL COMMUNITY RESPIRATION OF A SOFT-WATER LAKE, Connecticut Univ., Storrs. Inst. of Water

Resources.
For primary bibliographic entry see Field 2H.
W77-08296

DEVELOPMENT OF A COLUMN CHROMATOGRAPHY METHOD FOR FIELD OF PRECONCENTRATION OF TRACE METALS WITH APPLICATION TO THE HAW-CAPE FEAR RIVERS, N.C.,

North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.

For primary bibliographic entry see Field 5A.

DIFFUSE AGRICULTURAL POLLUTION: THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS,

Wisconsin Univ. Madison. Dept. of Agricultural Economics.

R. R. Schneider. Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 126, Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Thesis, 1976. 190 p, 29 fig, 57 tab, 8 maps, 67 ref, 3 append. OWRT A-063-WIS(1). 14-31-0001-

Descriptors: *Economics, Regulation, Water pollution control, *Sediments, *Nutrients, Agriculture, *Management, *Fertilizers, *Costs, *Wisconsin, Dairy industry, *Agricultural runoff, Water pollution sources, Farm wastes, *Nitrates, Groundwater, Nitrogen, Path of pollutants, Alternative costs.

The study examines policies designed to curtail 3 types of diffuse agricultural pollution, namely, 1. runoff from winter-spread manures; 2. sediment in rill and sheet erosion; 3. nitrate pollution of the ground water resulting from field-applied manure and chemical nitrogen. Policies tested on 4 farm sizes at 4 locations are: 1. enforce Wisconsin's

Model Sediment Control Ordinance; 2. prohibit manure spreading in winter; 3. prohibit winter manure spreading on sloped land; 4. prohibit winter manure spreading close to streams, lakes and open ditches; 5. restrict excess of applied nitrogen over estimated plant uptake of nitrogen; 6. combine 1, 3, 4 and 5 above; 7. combine 1, 2 and 5 above; 8. restrict average total sediment yield. Effects of these policies in the glaciated and unglaciated regions of the state are explored. Estimation of appropriate data for the economic analysis (partial competitive equilibrium) is an integral part of the study. Marginal cost of pollution reduction is calculated for each policy and a cost curve is generated for a sediment policy on selected farms. Data include physical quantities of pollutant reduction. Major conclusions are: 1. Sediment limit should be differentiated by region; 2. Sediment limits based on ton/acre/farm is superior to ton/acre/field; 3. Nitrate pollution from manure and chemicals is unlikely to be a major problem in Wisconsin; 4. Assuming compliance, the restriction of winter-spread manure to slopes of 4 percent or less is superior to complete prohibition of winter spreading. W77-08329

STATISTICAL CHARACTERIZATION OF DILUTE PARTICULATE SUSPENSIONS IN TURBULENT FLUID FIELDS,

Illinois Univ. at Urbana-Champaign. Dept. of Nuclear Engineering. C. C. Meek.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 052, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Thesis, 1972. 174 p, 54 fig, 4 tab, 33 ref, 4 append. OWRT A-019-ILL(4), B-042-ILL(2). 14-31-0001-3077.

Descriptors: *Dispersion, *Turbulent flow, *Water pollution, Air pollution, Instrumentation, *Turbulence, *Sedimentation, *Velocity, *Particle size, Particel shape, Isotropy.

Identifiers: *Particulate transport, Particulate

Identifiers: *Particulate transport, Particulate behavior, Stokesian drag.

Analytically, a theory simplified by the restrictive constraints of isotropy and Stokesian drag has been developed. Assumption of a reasonable parti-cle energy spectrum allowed calculation of various statistical quantities important in the determination of the particle's turbulent motion. By such an analysis three characterizing parameters were found. Two describe inertial effects due to the particle's size and density. They were found to be of prime importance in the determination of the ratio of the particle's fluctuating velocity variance to that of the fluid. The crossing of the particle from one region of correlated fluid turbulence to another by virtue of its free fall velocity is described by the third parameter. This parameter was shown to be of particular importance in limiting the particle's velocity correlation. The two effects, of inertial and of free fall velocity, together act to determine dispersion. A well parameterized particle experiment was undertaken. Analysis of the particles' behavior in the turbulent flow gave a three dimensional characterization of their motion. In particular calculations of velocity variances, au-In particular calculations of velocity variances, au-tocorrelations, and energy spectra were made. Comparison of theoretical prediction to experi-mental observation showed good agreement as long as the underlying assumptions inherent in the theoretical derivation were valid. Agreement suffered when these assumptions proved less valid. In particular non-Stokesian drag and anisotropic ef-fects caused disagreement between theory and experiment. W77-08330

THE EFFECTS OF URBANIZATION ON LOW FLOWS AND TOTAL RUNOFF, Purdue Univ., Lafayette, Ind. School of Civil En-

Purdue Univ., Lafayette, Ind. School of Civil Engineering. For primary bibliographic entry see Field 2A. W77-08335 POSSIBILITIES AND ROLE OF BIOLOGICAL ANALYSIS IN EVALUATING THE DEGREE OF POLLUTION OF WATER BODIES, (IN RUS-

SIAN), Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut. For primary bibliographic entry see Field 5A. W77-08430

FOX CHAIN OF LAKES INVESTIGATION AND WATER QUALITY MANAGEMENT PLAN, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 2H. W77.0842.

A STUDY OF COOLING INITIALLY UNIFORM AND THERMALLY STRATIFIED LAYERS OF WATER.

Purdue Univ. Lafayette, Ind. School of Mechanical Engineering. For primary bibliographic entry see Field 5G. W77-08444

SELECTIVE WITHDRAWAL AND HEATED WATER DISCHARGE: INFLUENCE ON THE WATER QUALITY OF LAKES AND RESERVOIRS PART I - SELECTIVE WITHDRAWAL, Wisconsin Univ. -Madison. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 5G. W77-08447

GROUNDWATER RESOURCES OF GUAM: OC-CURRENCE AND DEVELOPMENT,

Guam Univ., Agana. Water Resources Research Center.

For primary bibliographic entry see Field 4B. W77-08448

BACTERIOLOGICAL POLLUTION IN THE DRINKING-WATER OF JORDAN,

Ministry of Health, Amman (Jordan). Dept. of Bacteriology. A. Shehabi.

Environmental Conservation, Vol 3, No 3, p 197-199, Autumn, 1976. 2 tab, 7 ref.

Descriptors: Bacteriology, *Groundwater resources, *Water pollution sources, *Potable water, *Water pollution effects, *Human diseases, Water pollution control, Water pollution, Water resources, Water demand, Available water, Water quality, Sewage disposal, Solid wastes, Industrial wastes, Diseases, Groundwater, Aquifers, Enteric bacteria.

Many factors contribute to water pollution in Jordan. Among these are the inadequate means of sewage disposal, the obsolete methods employed in the management of solid waste, and the problems associated with industrial activity in high population density areas. Several aspects of bacteriological pollution control in the drinking water of Jordan are discussed. Water samples were collected from several areas of Jordan and analyzed. The results presented indicate that the present pollution-index of Jordan's water supply is significantly high in some regions. This is a major cause for alarm, as the bacteriological pollution of the underground water sources has been found to originate largely from excretal sources. The conclusion is reached that intensive efforts should be launched in order to prevent further pollution of groundwater in Jordan. (Jamail-Arizona) W77-08454

WATER QUALITY IN THE TEXAS COASTAL BASINS,

Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center. M. H. Frere, and O. D. Workman.

WATER QUALITY MANAGEMENT AND PROTECTION-Field 5

Sources Of Pollution-Group 5B

USDA Publication No ARS-S-163, May 1977. 8 p, 11 fig, 2 tab, 7 ref.

Descriptors: Water analysis, *Water quality, Basins, *Irrigation water, *Nitrates, Land use, Water resources, *Texas, *Gulf coastal plain, Water utilization.

Identifiers: *Texas coastal basins, Gulf coast

Ten years of water-quality records were examined to evaluate the usability of water in the Texas coastal basins, particularly for agriculture, and to determine if agriculture was affecting water quali-ty. Average values of 7 water-quality parameters in 2 periods (1964-69 and 1969-74) were calculated in 2 perious (1994-99 and 1995-74) were calculated for 23 rivers and basins. The quality of water for agricultural use decreased from the northeast to the southwest. The low quality of water in some basins requires special management for use. Nitrate concentrations were examined in relation to streamflow, seasons, land use, and years. The evidence did not indicate that agricultural activities were seriously degrading the stream water.

(ARS) W77-08465

TIME OF TRAVEL OF SOLUTES IN THE EAST FORK TRINITY RIVER, NOVEMBER 1975, AND ELM FORK TRINITY RIVER, DECEMBER 1975; TRINITY RIVER BASIN,

Geological Survey, Fort Worth, Tex. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-08472

LONGITUDINAL DISTRIBUTION OF SELECTED MICRONUTRIENTS IN NORTHERN SAN FRANCISCO BAY DURING

Geological Survey, Menlo Park, Calif. Water Resources Div.

For primary bibliographic entry see Field 5C. W77-08487

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PHYTOPLANKTON PRODUCTION AND ENU-MERATION IN NORTHERN SAN FRANCISCO

BAY DURING 1972, Geological Survey, Menlo Park, Calif. Water Resources Div

For primary bibliographic entry see Field 5C. W77-08488

IMPLICATIONS OF SEASONAL CHEMICAL AND PHYSICAL FACTORS ON THE PRODUCTION OF PHYTOPLANKTON IN NORTHERN SAN FRANCISCO BAY,

Geological Survey, Menlo Park, Calif. Water Resources Div.

For primary bibliographic entry see Field 5C. W77-08489

THE MATHEMATICAL DESCRIPTION OF THE BOD REACTION IN STREAM WATER, Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.
J. P. Hewitt.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 529, Price codes: AO7 in paper copy, AO1 in microfiche. PhD. Thesis, May 1973, 121 p, 13 fig., 19 tab., 59 ref., 3 append. OWRT A-025-N.J.(10), 14-31-0001-3830.

Descriptors: *Biochemical oxygen demand, Kinetics, *Oxygen demand, *Mathematical models, *Regression analysis, Decomposing or-ganic matter, Oxygen sag, Pollutants, Water pollu-tion, Model studies. Identifiers: *First order kinetics, *Second order kinetics, *Retardation equations, *Simultaneous first order kinetics.

The mathematical description of the Biochemical Oxygen Demand, BOD, for stream water samples is examined. Mathematical expressions which have been offered as alternatives to the first order model are considered for possible application in stream water BOD modelling. All BOD models were fitted to the BOD data using the Gauss-New-post-train method for solving pon-linear regressions. ton iteration method for solving non-linear regression problems, Biomedical Computing Program BMDX85. The first order model fails to describe adequately the BOD process as evidenced by the poor distribution of residual errors. Other order models, from first to fourth order in steps of 0.5, failed to improve the residual error distribution. The retardation model could not be successfully fitted to stream water BOD data, and where ob-tained, the distribution of the residual errors was slightly improved as compared to the first order model. A BOD model was proposed of the type dL/dt = -kL - k'L(1 + t2) which on integration produces an equation which in 65% of the cases examined gave significant reductions in residual sum of squares. (Hunter-Rutgers)

A COMPARISON OF THE METHODS FOR CALCULATING THE CONSTANTS FOR THE FIRST ORDER BOD EQUATION, Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.

J. P. Hewitt.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 518, Price codes: A04 in paper copy, A01 in microfiche. M. S. Thesis, June 1971. 67 p, 1 fig., 10 tab., 23 ref, 2 append. OWRT A-025-N.J.(9). 14-31-0001-3230.

Descriptors: *Biochemical oxygen demand, *Kinetics, *Oxygen demand, *Mathematical models, *Regression analysis, Decomposing organic matter, Oxygen sag, Pollutants, Water pollution, Model studies, Methodology. Identifiers: *First order kinetics.

Six simplified methods for calculating first order BOD constants were compared with the original Reed-Theriault procedure, using BOD vs t data for 20 receiving water samples from the state of New Jersey. None of the simplified methods proved acceptable. Deviations of up to 158% were observed for k values and up to 315% for Lo values. The use of such methods should be avoided.

PREDICTION MODELS OF REAERATION RATE FOR MOUNTAIN CREEKS, Utah State Univ. Dept. of Civil and Environmental

Engineering. For primary bibliographic entry see Field 5G. W77-08501

PHOSPHORUS EXCHANGE AT THE SEDI-MENT-WATER INTERFACE OF SELECTED NARRAGANSETT BAY SEDIMENTS,

Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 5C.

FOREST FERTILIZATION AND WATER QUALITY IN THE NORTH CAROLINA PIED-

MONT, North Carolina State Univ., Raleigh. School of Forest Resources. S. G. Sanderford.

S. U. Sanderford. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-268 621, Price codes: A03 in paper copy, A01 in microfiche Technical Report No. 53, March 1975. 42 p. 1 fig, 11 tab, 35 ref. OWRT A-085-NC(2), 14-31-0001-

Descriptors: *Fertilization, Water quality, Nutrients, Nitrogen, Phosphorus, Potassium,

Drainage, Forest management, *Forest watersheds, Loblolly pine trees, *North Carolina. Identifiers: *Nutrient losses.

The study was established to determine the effects of N-P-K fertilization on water quality in a forested watershed in the North Carolina Piedmont. A proportional water sampler was used to monitor natural nutrient levels from January 1972 monitor natural nutrient levels from January 1972 through March 1973. Approximately one-eighth of the watershed was then fertilized (110 kg-N/ha, 24 kg-P/ha, and 47 kg-K/ha) and nutrient monitoring continued through March 1974. Continuous streamflow hydrographs and precipitation records were maintained for the experiment's duration. Comparisons were made between pre and post-continual nutrient contents and leaves from Comparisons were made between pre and post-treatment nutrient concentrations and losses from the watershed. Only very slight changes in dis-solved NO3-N, NH4-N, P, K, Ca, and Mg concen-trations were detected following treatment. All concentrations were very low. Kilogram per hec-tare nutrient losses in the dissolved state were not significantly increased following treatment. Seasonal nutrient level variations, although ob-served, were slight. It was concluded that forest fertilization had no detrimental effects on water quality. (Stewart-NC State)

FRACTIONATION AND CONTROL OF IRON IN CHANNELIZED AND SWAMP DRAINAGE STREAMS IN NORTH CAROLINA, East Carolina Univ., Greenville, N.C. Dept. of

Biology. D. S. Vodopich.

D.S. Vodopica. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-268 625, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, May 1975. 56 p. 5 fig. 8 tab, 35 ref. OWRT A-080-NC(2), 14-31-0001-5033.

Descriptors: *Channel improvement, *Swamps, *Iron, Organic matter, Water quality, *Drainage, Streambeds, Organic carbon, Phosphorus, Heavy metals, Chemical analysis, *North Carolina, Sediment transport, Streams.

Identifiers: *Channelization, *Factionation(Iron), Iron analysis, Organic carbon.

A channelized stream and swamp drainage stream in eastern North Carolina were investigated as to their capacity to transport and fractionate iron. Several water quality parameters were considered with special attention given to organic matter as a control. Between May and September 1974, measurements of dissolved oxygen, pH, temperature, conductivity, flow, organic carbon, and iron, in-cluding organically complexed iron, were made and correlated. The two stream systems were found to fractionate and discharge iron differently tound to fractionate and discharge from differently both qualitatively and quantitatively. The mean total iron concentration of the swamp and channelized streams were 2.06 and 1.46 mg/l respectively. The swamp was consistently higher in both the percentage of total iron dissolved and the percentage of total iron dissolved an age of organically complexed iron dissolved. Suspended particulate matter was a major influence on fractionation. The major role of organic matter was the production of a reducing environ-ment rather than a significant binder of iron. (Stewart-NC State) W77-08510

WATER QUALITY IMPACTS OF URBANIZA-TION-A METHODOLOGY, Economic and Social Commission for Asia and the Pacific (UN), Bangkok (Thailand). Div. of Indus-

try, Housing, and Technology. K. F. Jalal.

N. P. Janu. Journal of the Environmental Engineering Divi-sion-ASCE, Vol. 103, No. EE1, p 49-57, February, 1977. 2 fig, 4 tab, 2 append.

Descriptors: *Model studies, *Urban runoff, Water quality, Design, Planning, Pollutant identifi-cation, Cities, Urban areas, Water quality control,

Group 5B-Sources Of Pollution

Identifiers: STORM runoff model.

The STORM (Storage Treatment Overflow Runoff Model) model was used in Canada to investigate the effects of urbanization on water quality. Three steps are involved in the application of the model for this purpose: long-term simulation of runoff quantity and quality for all planning alternatives; comparison of alternatives; and determination of the storage-treatment relationship and the op-timum storage-treatment combination for the preferred alternative. Using the model can produce the optimum storage-treatment combinations for meeting a given water quality objective at minimum cost. (Collins-FIRL)

FACTORS AFFECTING THE DENITRIFICA-TION RATE IN TWO WATER-SEDIMENT SYSTEMS, Agricultural Univ., Wageningen (Netherlands).

Dept. of Microbiology. J. F. van Kessel.

Water Research, Vol. 11, No. 3, p 259-267, 1977. 9 fig. 4 tab, 32 ref.

Descriptors: *Denitrification, *Temperature, *Dissolved oxygen, Sediments, Evaluation, Analysis, Physical properties, Chemical properties, Activated sludge, Nitrogen, *Nitrates, Sediment-

Two water-sediment systems were studied to analyze denitrification rates, and to determine the effects of temperature, dissolved oxygen, nitrate concentrations in the water above the sediment, and the thickness of the sediment layer on these rates. Sediment A was from the top 10 centimeters of a ditch containing effluent of an activated sludge aeration treatment facility using slurry from meat production calves. Type B was from a similar layer for a ditch containing water drained from arable land. Denitrification was slightly decreased when dissolved oxygen increased from 0 to 2 milligrams/liter in overlying water. Further increases in DO concentrations had no further decreasing effect. Denitrifiction depended on nitrate concentrations in the overlying water when these concentrations were low. It occurred more independently as the nitrate concentrations increased. Denitrifica-tion began after an extended lag at 4 C. Denitrification, as well as nitrification, proceeded rapidly at 15 and 25 C. With nitrate-nitrogen concentrations of 25.2 milligrams/liter, a 7 millimeter layer of sediment A and a 14 millimeter layer of sediment B influenced denitrification. Added means of nitrate transport into the sediments were expected to produce lower denitrification rates in natural environments. (Collins-FIRL) W77-08517

TRENCHING SLUDGE MAY BE SAFE For primary bibliographic entry see Field 5E. W77-08594

5C. Effects Of Pollution

IMPACT OF TOXIC CLONES OF BLUE-GREEN ALGAE ON WATER QUALITY AS RELATED TO AQUATIC ANIMALS, New Hampshire Univ., Durham. Dept. of Zoclo-

P. J. Sawyer, M. Ikawa, and J. J. Sasner, Jr. Available from the National Technical Informa Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 594, Price codes: A03 in paper copy, A01 in microfiche. New Hampshire Water Resources Research Center, Durham, Completion Report, Research Report No. 12, (1977). 35 p., 3 fig, 4 tab, 39 ref. OWRT A-021-NH(5). 14-31-0001-3029.

Descriptors: *Cyanophyta, Anabaena, *Toxicity, Eutrophication, *Algal toxins, Algae, Aquatic algae, North America, Water quality, *New

Hampshire, Oxygen, Chromatography, *Biodegradation, Decomposing organic matter, Water pollution effects. Identifiers: *Anabaena flos-aquae, *Microcystis aeruginosa, *Aphanizomenon flos-aquae, Toxic species, *Oxygen depletion.

The literature indicates that toxic blooms of bluegreen algae occur widely. Gorham (1966) cited references describing blue-green algal poisonings from Russia, Argentina, Australia, Morocco, Bermuda, Brazil and Finland. In North America these blooms have been most frequently reported from North Dakota, South Dakota, Minnesota, Iowa, Wisconsin, Illinois, Michigan, Alberta, Saskatchewan, Manitoba and Ontario (Gorham, 1966). Several species of blue-green algae have been associated with these toxic blooms in North America, but the most commonly occuring toxic species are Anabaena flos-aquae, Microcystis, aeruginosa and Aphanizomenon flos-aquae. All three of these occur from time to time in New Hampshire and they occur in both toxic and nontoxic forms. Problems concerning the toxicity of these species occur when heavy concentrations of them decompose naturally. The products of decomposition plus toxic substances from within the cells cause death or illness to many mammals, birds and fishes at that time. Also, associated with the decomposition of large amounts of organic matter, low oxygen concentrations may occur. The combination of toxic substances and low oxygen levels is rapidly fatal to many aquatic organisms. This is the usual manner of toxic manifesta-W77-08104

EFFECT OF METALS ON PHOTOSYNTHESIS OF MARINE PHYTOPLANKTON, (IN RUS-

All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR). S. A. Patin, and V. N. Tkachenko. Biol Nauki. 17(5), p 67-69, 1974.

*Mercury, Descriptors: *Photosynthesis, *Copper, Metals, *Phytoplankton, Water pollution effects, *Marine algae, Salts, Nutrients, Seasonal, Primary productivity. Identifiers: Ditylum-Brightwellii, Gyrodinium-Fissum, Nephrochloris-Salina.

A study of the effect of Hg and Cu salts on 3 spp. of marine unicellular algae (Ditylum brightwellii, Gyrodiniuum fissum, Nephrochloris salina) in culture showed that the rate of C assimiltion drops considerably at concentrations of these salts equal to or less that the maximum allowable concentration (5-10 micro-g/1) in water. The biological after effects of water pollution, at least with respect to primary production, may depend on the level of pollution and on the season The data suggest a greater resistance of unicellular algae to the effect of high concentrations of Hg (10 micro-g/1 and higher) in the presence of an excess of nutrients.— Copyright 1975, Biological Abstracts, Inc. W77-08160

COMPARATIVE EXAMINATION OF ENTEROCOCCI OBTAINED FROM DRINKING WATER, FOODSTUFFS AND URINE, (IN GER-

MAN), For primary bibliographic entry see Field 5A.

A STATISTICAL ANALYSIS OF THE MERCU-RY CONCENTRATIONS IN FISH FROM LAKE JOCASSEE, SOUTH CAROLINA, Clemson Univ., S.C. Dept. of Environmental

Systems Engineering. For primary bibliographic entry see Field 5A. W77-08190

ARSENIC IN WATER AND FISH FROM LAKES ARSENIC IN WATER AND FISH FROM LAKES
HARTWELL, KEOWEE, AND JOCASSEE,
SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Environmental
Systems Engineering.
For primary bibliographic entry see Field 5A.

A SURVEY OF CADMIUM OCCURRENCE AND CONCENTRATION IN FISH FROM ELEVEN MAJOR RESERVOIRS IN SOUTH CAROLINA, Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5A.
W77-08192

EFFECTS OF PH AND INORGANIC CARBON CONCENTRATIONS UPON COMPETITION BETWEEN ANABAENA FLOS-AQUAE AND SELENASTRUM CAPRICORNUTUM,

Maine Univ., Orono. Dept. of Civil Engineering. J. A. Olofsson, Jr., and F. E. Woodard. J. A. Olotsson, J. T., and F. E. Woodard. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267 720, Price codes: A04 in paper copy, A01 in microfiche. University of Maine Land and Water Resources Institute, Completion Report, April 1977. 55 p, 18 fig, 6 tab, 60 ref. OWRT A-034-ME(1).

Descriptors: Water pollution effects, Water pollution control, Algae, *Anabaena, Competition, Inhibitors, Lakes, Management, *Photosynthesis, Eutrophication, *Hydrogen ion concentration, Carbon, *Cyanophyta, *Chlorophyta, Dominant organisms.

Identifiers: Affinity, Algal bloom initiation, Car-

bonic anhydrase activity, Diamox, Dominance, Anabaena flos-aquae, Photosynthetic rate, *Selenastrum capricornutum, *Total inorganic

Relative competitiveness of a selected green alga and blue-green alga was examined in relation to culture pH and total inorganic carbon (CT) in an effort to uncover a mechanism which might be influential in blue-green algal bloom initiation. Short-term growth experiments were conducted employing Anabaena flos-aquae, a bloom forming employing Anabaena flos-aquae, a bloom forming blue-green alga, and Selnastrum capricornutum, a green alga. A. flos-aquae, at a given level of CT, exhibited increasing photosynthetic rate as pH in-creased, and reached a maximum in the region of pH 9.5 to 10.0. S. capricornutum, however, exhibited decreasing photosynthetic rates as pH was increased. Photosynthetic rates of A. flos aquae exceeded those of S. capricornutum above pH 7.5, indicating potential pH-related enhancement of blue-green photosynthesis. Carbonic anhydrase was implicated in facilitating photosynthetic rates was implicated in facilitating photosynthetic rates in A. flos-aquae by using a specific inhibitor of carbonic anhydrase activity. Outside the pH range of 8.35 to 9.0, when the inhibitor Diamox (5-acetamido-1,3,4-thiadiazole-2-sulphonamide) was introduced, significantly reduced photosynthetic rates were observed in A. flos-aquae. It was concluded that A. flos-aquae was a higher affinity for inorganic carbon (as evidenced by photosynthetic rates) than does S. capricornutum due to carbonic anhydrase activity. An overall conclusion is that periodic dominance of the lacustrine phytoplankton by bloom forming blue-green algae may be re-lated to competitive uptake of inorganic carbon facilitated by carbonic anhydrase activity. Facilitated carbon transport in blue-green algae may provide additional insight into the management of blue-green algal blooms in surface water resources. W77-08200

SPRAY IRRIGATION OF TREATED MUNICIPAL SEWAGE EFFLUENT AND ITS EF-FECT ON CHEMICAL PROPERTIES OF

FOREST SOIL,
Pennsylvania State Univ., University Park. Inst.
for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.

W77-08202

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ORGANOCHLORINE RESIDUES IN NEW ZEA-LAND BIRDS AND MAMMALS 2. POLYCHLORINATED BIPHENYLS, Department of Agriculture, Wellington (New Zea-land). Wallaceville Animal Research Center. S. R. B. Solly, and V. Shanks. New Zealand Journal of Science, Vol. 19, p. 53-55, 1976. 1 tab, 13 ref.

Descriptors: *Polychlorinated biphenyls, *Birds, *Mammals, *Wildlife, *Absorption, Path of pollutants, Foodchains, Mode of Action, Water quality, Toxicity, Analytical techniques, Laboratory tests,

Toxins.

Identifiers: "New Zealand, "Bioaccumulation, "Tissue analysis, Kingfisher, Gannet, Giant petrel, Dolphins, Fur seals, Sea-leopard, Halcvon sancta, Sula serrator, Macronectes giganteus, Delphinus delphis, Arctocephalus tersteri, Ogmorhinus leptonyx.

Between September 1966 and July 1973, 627 specimens of wildlife comprising 61 species of birds and 17 species of mammals were analysed for polychlorinated biphenyls. Specimens were colected from the 3 main islands of New Zealand, from the Chatham, Kermadec, and Snares groups of islands, and from Campbell Island and Norfolk Island. Residues were found in 57 specimens comprising 16 species of birds, these were either carnivorous or omnivorous. High individual residues were found in a kingfisher, a gannet, a giant petrel, and in captive dolphins, fur seals, and a sealeopard. (See also W70-09978) (Katz).

MINERAL CYCLING IN RESERVOIRS, Oklahoma State Univ., Stillwater. Dept. of Zoolo-

gy.
D. W. Toetz.
Available from the National Technical Information Service, Springfield, VA 22161 as ORO-425 430, Price codes: A02 in paper copy, A01 in microfiche. Presented at Symposium on Reservoir Resources, November 1974, Durant, Okla. 2 fig., 1 tab., 56 ref. OWRT A-049-OKLA(2), AEC AT-(40-1)-4254.

Descriptors: *Reservoirs, *Cycling nutrients, *Nitrogen, Phosphorus, Limiting factors, Reviews, *Oklahoma.
Identifiers: *Nitrogen sources, *Literature review, Mineral cycling.

A selective litetature review of nitrogen cycling and its impact on studies of eutrophication in Oklahoma reservoirs cites factors involved in quantification of a reservoir nutrient budget. Inputs of biologically-useable nitrogen in the form of precipitation, gas, and by means of biological fixing and so the procipitation are discussed, as are nitrogen releases from newly-flooded soils and soils inundated by rising water lyels. The importance of river influents to newly-flooded soils and soils inundated by rising water Ivels. The importance of river influents to impoundments as they relate to varous land uses of the drainage basin and seasons is also described. The impacts of groundwater as a nitrogen source, atmospheric precipitation, and biological nitrogen fixation by heterocystous bluegreen algae, some bacteria and fungi are also reviewed. Various nitrogen loss pathways are discussed: sinkage to the sediments, fish catch, aquatic macrophyte removal, groundwater recharge, hypolimnetic withdrawal during stagnation, and biological recycling. Management strategies for reservoirs should be related to models incorporating the major mechanisms affecting the whole system. (Auen-Wisconsin).

THE ACCUMULATION AND DISTRIBUTION OF ORGANOCHLORINES AND SOME HEAVY METALS IN AMERICAN FALLS RESERVOIR FISHES, WATER AND SEDIMENT, Idaho State Univ., Pocatello. Dept. of Zoology.

For primary bibliographic entry see Field 5B. W77-08287

BIOCHEMICAL TRANSFORMATION AND DETOXIFICATION OF MERCURY IN AQUATIC ENVIRONMENT, Georgia Univ., Athens. Dept. of Food Science.

Georgia Univ., Athens. Dept. of Food Science. M. K. Hamdy.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 926, Price codes: A05 in apper copy, A01 in microfiche. Georgia Environmental Resources Center, Atlanta, Report ERC 02-77, February 1977. 86 p, 24 fig. OWRT B-69-GA(3), 14-31-0001-3870.

Descriptors: Resistance, *Food chains, *Enteric bacteria, *Mercury isolation, Inhibition, *Absorption, Cultures, Trophic level, Rubber, *Pollution abatement, Water pollution control. Identifiers: *Biotransformation, *Methylmercury, *Enterobacter aerogenes, *Detoxification of Hg2+, Enzyme inhibition, NADH inactivation, Reversal of inhibition, Oxalacetate, 203Hg2+-up-take, Depuration, Biotransference, *Chemisorption by rubber.

Mercury-resistant cultures were isolated from sediments and adapted to resist higher levels of Hg2+. One of these cultures, identified as Enterobacter aerogenes, was able to produce methylmercury (MM) from HgCl2. It appears that the transformation of Hg2+ to MM is a detoxification process by the bacteria. Mercury not only affected intact bacterial cells but also inhibited their enzymes and many of their metabolites, particularly NSDH, the coenzyme moity of LDH and MDH enzymes. Mercury inactivated NADH but this reaction can be reversed by the addition of oxalacetate. Mercury uptake, concentration and depuration by cells of different trophic levels was affected by the form of mercury, incubation time and temperature and by the age of cells. The rate of transference of 203Hg2+ decreased with trophic levels of food chains. Rubber was an excellent inert agent for effectively removing Hg2+ cellent inert agent for effectively removing Hg2+ and is recommended for control of mercury pollution. W77-08289

THE INFLUENCE OF BRACKISH-WATER INTRUSION ON MACROINVERTEBRATE ASSOCIATIONS OF THE LOWER TCHEFUNCTE RIVER, LOUISIANA, New Orleans Univ., La. Dept. of Biological

Sciences. For primary bibliographic entry see Field 5B. W77-08292

BENTHIC MICROBIAL COMMUNITY RESPIRATION OF A SOFT-WATER LAKE, Connecticut Univ., Storrs. Inst. of Water

Resources. For primary bibliographic entry see Field 2H.

MERCURY ACCUMULATION IN TROUT OF SOUTHERN MISSOURI, Missouri Univ.-Rolla. Dept. of Chemistry. E. T. Lloyd, W. T. Schrenk, and J. O. Stoffer. Environmental Research, Vol. 13, p 62-73, 1977. 4 fig. 1 tab, 20 ref. OWRT A-083-MO(2), 14-34-0001-5025.

Descriptors: Mercury, Fish, *Missouri, *Absorption, Trout, Pollutant identification, Analytical techniques, Water pollution effects. Identifiers: Atomic absorption.

A study of mercury accumulation in trout taken A study of mercury accumulation in trout taken from the trout parks and streams of southern Mis-souri is presented. Mercury in trout is determined by digestion in nitric acid, sulfuric acid, and potas-sium permanganate, followed by reduction and aeration for measurement by cold vapor atomic adsorption. The mercury accumulation in the trout ranged from 0.1 to 0.3 ppm of mercury (micro-g of mercury/g of tissue). Previous analysis of trout collected in the mid- to late 1940s from the same areas indicated mercury accumulations of approximately 3 ppm. Over the past 25 years, there appears to be a decrease in mercury found in trout of southern Missouri.

W77-08304

CHROMOSOME MUTATIONS IN A FERN POPULATION GROWING IN A POLLUTED ENVIRONMENT: A BIOASSAY FOR MUTAGENS IN AQUATTIC ENVIRONMENTS, Massachusetts Univ., Amherst. Dept. of Botany. For primary bibliographic entry see Field 5A. W77-08305

CHARACTERISTICS OF THE BIOTIC CYCLE OF LAKE BAIKAL, (IN RUSSIAN), Limnologicheskii Institut, Irkutsk (USSR). For primary bibliographic entry see Field 2H. W77-08321

EFFECT OF SOME CHEMICAL ELEMENTS ON THE ACCUMULATION OF CESIUM-137 IN FRESHWATER FISH, (IN RUSSIAN), Ministerstvo Zdravookhraneniya SSSR, Moscow.

Institut Biofiziki.

Gig Sanit. 6, p 111-113, 1974.

Descriptors: *Magnesium, *Sodium, *Sulfates, *Bicarbonates, Freshwater fish, *Chlorides, Water pollution effects. Identifiers: *Cesium-137.

A change of the concentrations of Mg, Na, sulfate and bicarbonate in water does not affect the content of Cs-137 in freshwater fish. On increasing the content of chlorides in water by 10-20-fold the accumulation coefficient of Cs-137 in bones decreases by a factor of 2-3 and in muscles by a factor of 3-4.—Copyright 1975, Biological Abstracts Legs. stracts, Inc. W77-08322

THE PRODUCTIVITY OF FOULING ORGAN-ISM ASSOCIATIONS IN LAKE ZELENET-SKOE, (IN RUSSIAN), Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
A. F. Alimov, and V. N. Nikulina. Gidrobiol Zh. 10(2), p 29-35, 1974.

Descriptors: Lakes, "Primary productivity, Fouling, Littoral, "Diatoms, Aquatic algae, Diptera, Mayflies, Gastropods, Oligochaetes, Stoneflies, Water pollution.
Identifiers: "Achnanthes-minutissima, "Lake Zelenetskoe(USSR), "Fouling organisms.

In the rocky littoral of Lake Zelenetskoye diatoms are predominant, especially Achaanthes minutissima. The animal fouling organisms are mainty Chironomidae, Plecoptera and Ephemeroptera larvae as well as oligochaetes and gastropods. Algal productivity is close to 0.18 kcal/m2 or 27% of the total abstrace and the control of the control productivity is close to 0.18.kcal/m2 or 27% of the total phytoplankton production; animal biomass exceeds 1.6-2.3% of the fouling community biomass. No strength in trophic relations was observed between animals of the fouling community. Algae play an important role in primary production in a lake of low productivity.—Copyright 1975, Biological Abstracts, Inc.

LAKE NAIVASHA AND LAKE NAKURU: AN ECOLOGICAL COMPARISON BETWEEN TWO BIRD LAKES IN EAST AFRICA, (IN SWEDISH), Uppsala Univ. (Sweden). Inst. of Zoology. For primary bibliographic entry see Field 2H. W77-08324

Group 5C-Effects Of Pollution

A PRODUCTIVITY STUDY OF THE ROANOKE RIVER ABOVE NIAGRA DAM IN VIRGINIA, Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering. J. H. Sherrard, and J. L. Hoyle.

Available from the National Technical Information

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 114, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 104, June 1977. 65 p, 21 tab, 12 fig, 43 ref. OWRT B-063-VA(1).

Descriptors: *Eutrophication, Nutrients, *Nitrogen, *Phosphorus, *Virginia, *Bioassay, Sampling, Monitoring, *Pollutant identification, *Productivity, Algae, Anabaena, *Growth rates, Water pollution effects.

Water pollution effects. Identifiers: *Roanoke River(Va), Selenastrum capriconutum, *Smith Mountain Lake(Va), *Algal assay, *Algal growth potential.

Deterioration of the water quality in the upper end of the Roanoke River of Smith Mountain Lake due to eutrophication has caused much concern. The Smith Mountain Lake impoundment was con-structed in 1965 as a pump storage facility to generate electrical energy and has served as a major recreational area for Southwestern Virginia. Eight sampling stations were established along the length of the Roanoke River from an agricultural area in Montgomery County through the urban area of Roanoke Salem to Niagra Dam above Smith Mountain Lake. On 12 occasions, approximately once a month, grab samples were taken at the sampling stations. Samples were analyzed for general parameters and for nitrogen and phosphorus. The Algal Assay Procedure Bottle Test (Environmental Protection Agency, 1971) was conducted with the samples, and in addition, with samples in which phosphorus and/or nitrogen spikes were added to determine potential produc-tivity and to determine which element was limiting productivity. Results demonstrate that the algal assay bottle test is useful in correlating phosphorus concentrations with algal growth rate. Phosphorus was found to limit the algal growth in the Roanoke River above the Roanoke wastewater treatment plant for Selenastrum capricornutum and Anabaena flos-aquae, the two algal species used in this study. Maximum specific growth rates tended to increase with increasing phosphorus concentration.

HYPOPHTHALMICHTHYS MOLITRIX (VAL.)) FOR INCREASING FISH PRODUCTIVITY AND DECREASING THE LEVEL OF EUTROPHICA-TION OF DNIEPER RESERVOIRS, (IN RUS-SIAN),

Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.

P. S. Vovk. Vopr Ikhtiol. 14(3), p 406-414, 1974.

Descriptors: Fish reproduction, *Eutrophication, Reservoirs, *Cyanophyta, *Carp, Fish food organisms, Fish diets, Fish, Seston, Anabaena, Toxicity, *Algal toxins, Water pollution effects.

Identifiers: Anabaena-hassalii, Anabaena-scheremetievi, Anabaena-variabilis,

Aphanizomenon-flos-aquae,
"Hypophthalmichthys-molitrix, Microcystis-aeruginosa, Oscillatoria-agardhii, USSR, *Silver carp,
"Dnieper River reservoirs(USSR).

The role is shown of blue-green algae (Aphanizomenon flos-aquae, Oscillatoria agardhii, Anabaena variabilis, A. scheremetievi, A. hassalii, etc., and especially Microcystis aeruginosa) in feeding of the silver carp (Hypophthalmichthys molitrix) and their food significance for other fish species in reservoirs on the Dnieper River (USSR). The problem of the possible effect of toxic excretion of blue-green algae on the silver carp is discussed. It is expedient to stock the silver carp for foraging in the reservoirs in order to increase fish productivity and decrease the level of

eutrophication of these water bodies due to the utilization of a considerable part of the seston.--Copyright 1975, Biological Abstracts, Inc. W77-08364

TROPHIC STATUS OF INLAND LAKES FROM LANDSAT.

Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5A.
W77-08434

FOX CHAIN OF LAKES INVESTIGATION AND WATER QU. LITY MANAGEMENT PLAN, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 2H.

INVERTEBRATE COLONIZATION OF ARTIFICIAL SUBSTRATES IN SAN LEANDRO CREEK,

California Univ., Berkeley. Dept. of Forestry and Conservation.

For primary bibliographic entry see Field 5A. W77-08443

POPULATION DYNAMICS AND SPECIES DIVERSITY OF ICHTHYO-PARASITOFAUNA OF THE BUFFALO NATIONAL RIVER, Arkansas Univ., Fayetteville. Dept. of Zoology.

R. V. Kilambi, and D. A. Becker.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 235,

Price codes: A06 in paper copy, A01 in microfiche.

Arkansas Water Resources Research Center,

Fayetteville, Publication No. 48, 1977. 85 p. 2 fig.,

17 tab., 27 ref. OWRT A-029-ARK(1), CX

700040182.

Descriptors: Worms, Fish diseases, Water pollution effects, Mortality, Copepods, Water quality, *Arkansas, Bass, Sunfishes, *Fish parasites, Growth rates, Seasonal.

Identifiers: *Darters, Bertalanffy growth formula, River pool, Riffle, Seasonal abundance, Gyros, Flukes, *Buffalo National River(Ark).

Monthly fish collections using electro-shocking instruments and seines were made at upstream, midstream, and downstream stations from January 1974 through February 1975 on the Buffalo River, Arkansas. A sharp decrease in smallmouth bass (SMB) marginal scale increment was evident during May for age group 1+. The estimated length weight relationship for SMB was: log W = 3.0 log L-4.97666 with an average condition factor of 1.1. A Bertalanffy growth formula for describing growth of SMB was Lt = 583 (1 - e 0.14 (t + 0.48). SMB were estimated to attain 95% of the asymptotic length at 21 years and weigh 4.6 lb. Annual mortality rate was lower for SMB of the Buffalo River than other reported U.S. waters. Forty-one species of fish were collected of which the most abundant fishes in pools were the Longear sunfish and the Big eye shiner. The number of fishes collected among pools was significantly different while seasonal abundance was not. The most abundant species in riffles were the Yoke darter and Rainbow darter. Thirty-two species of helminth and copepod parasites were taken from 127 SMB with all fish infected with at least one species. Parasites infecting high percentages of hosts and occurring in large average numbers of parasites per fish were Gyros, Pyloric caecal and intestinal flukes, and the spiny-headed worm. Icthyoparasite mean diversity indicies revealed a rich and diverse fauna with site and seasonal distributions indicative of a complex ecosystem. There were no significant correlations between any parasites and recorded water quality parameters. (Barnes - Arkansas) W77-08446

REPRODUCTION RATE AND PRODUCTIVITY
OF BACTERIA IN THE PONDS OF THE
KARAMET-NIYAZ FISHERY FARM, (IN RUS-SIAN),
Akademiya Nauk URSR. Kiev. Instytut

Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.

O. I. Bogdanovich. Gidrobiol Zh. 10(2), p 22-28, 1974.

Descriptors: *Bacteria, Ponds, *Fish hatcheries, *Productivity, *Reproduction, Seasonal, Fertilization, Water pollution effects.

tion, water polution effects.

Identifiers: Aristichthys-nobilis, Ctenopharyngodon-idella, Hypophthalmichthys-molitrix,
*Turkmen-SSR, USSR, Silver carp, Bighead,
White amur.

The time of bacterial brood succession was determined for ponds using different fertilizer application patterns in the turkmenian SSR (USSR). Average seasonal fluctuations were 10-30 h in spring, 30-70 h in summer and 20-35 h in autumn. No relation between the reproduction rate and intensification measures applied was found. Daily bacterial productivity and daily P/B (Production/biomass)-coefficient (based on destruction) were calculated. Infertilized ponds the daily bacterial productivity reached 2.57-4.50 mg/l, in unfertilized ponds and in the channel this index was lower 0.2-2.1 mg/l. The daily P/B-coefficient was 0.30-3.57. Silver carp (Hypophalmichthys molitrix), white amur (Ctenopharyngodon idella) are raised in the ponds.—Copyright 1975, Biological Abstracats, Inc.

THE ECOLOGICAL SIGNIFICANCE OF AN-TIBIOTIC SUBSTANCES EXCRETED BY ALGAE IN WATERS, (IN POLISH),

Polskie Towarzystwo Przyrodnikow im. Kopernika, Warsaw. S Niewolak

Wszechswiat. 7/8, p 194-196, 1973.

Descriptors: *Ecology, Algae, *Antarctic, *Waterfowl, *Algal toxins, Bacteria, Fungi, Bactericides, Fungicides, Water pollution effects. Identifiers: *Phaeocystis-pouchetii, *Antibiotic properties(Algae).

Inhibition of microflora development in the alimentary tract of antarctic water fowl during maximal development of Phaeocystis pouchetii suggested that algae might be a source of antibiotics. Consequently, 4 groups of antibiotic substances produced by algae were distinguished. Algae directly or indirectly influenced the density of fish in waters. They were also shown to have bactericidal and fungicidal properties. Antibotic substances produced by algae could be used as a preservative in the fish processing industry. Antibotic properties of a number of algae are listed in tabular form. —Copyright 1975, Biological Abstracts, Inc.
W77-08463

LONGITUDINAL DISTRIBUTION OF SELECTED MICRONUTRIENTS IN NORTHERN SAN FRANCISCO BAY DURING 1973,

Geological Survey, Menlo Park, Calif. Water Resources Div.

T. J. Conomos, and D. H. Peterson.
In: Proceedings of a Workshop on Algae Nutrient
Relationships in the San Francisco Bay and Delta,
held at Clear Lake, California, November 8-10,
1973: The San Francisco Bay and Estuarine Association, p 103-126, 1975. 12 fig, 6 tab, 23 ref.

Descriptors: *Aquatic microorganisms, *Phytoplankton, *Nutrients, *Estuarine environment, *Bays, *California, Phosphates, Nitrates, Nitrites, Ammonia, Silicates, Turbidity, Seasonal, Distribution patterns.

Identifiers: *San Francisco Bay estuary, Micronutrients, Seasonal fluctuations

Investigations in the San Francisco Bay estuary during 1972 indicate that seasonal variations in micronutrient concentrations are associated with seasonal variations in phytoplankton abundances.

Micronutrient concentrations are generally lower in summer than winter. During summer the river input of micronutrients to the estuary is high; during winter the converse is generally true. Certain micronutrient distributions tend to be more conservative in winter than summer, suggesting their distributions are dominated by advective and difusive processes in winter. (Woodard-USGS) W77-08487

PHYTOPLANKTON PRODUCTION AND ENU-MERATION IN NORTHERN SAN FRANCISCO BAY DURING 1972, Geological Survey, Menlo Park, Calif. Water

Resources Div.

E. P. Scrivani.

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E. F. Schvain. In: Proceedings of a Workshop on Algae Nutrient Relationships in the San Francisco Bay and Delta, held at Clear Lake, California, November 8-10, 1973: The San Francisco Bay and Estuarine As-sociation, p 127-146, 1975. 4 fig, 2 tab, 46 ref.

Descriptors: *Phytoplankton, *Ecosystems, *Estuarine environment, *Bays, *California, Nutrients, Aquatic microorganisms, Diatoms, Dissolved oxygen, Water chemistry, Photosynthesis,

Distribution patterns.

Identifiers: *San Francisco Bay estuary, Phytoplankton productivity.

The phytoplankton and primary productivity of north San Francisco Bay, California, were investigated during hydrographic surveys in 1972. Samples were collected on a near-monthly basis in the main channel of the estuary. A phytoplankton standing stock maxima occurred in the Suisun Bay region. During peak periods, the cell numbers typi-cally exceeded 1500 cells/milliliter and reached a maximum starting in June and continuing through early October. Diatoms were the most abundant phytoplankton in early spring. Primary productivity values correlated with standing stock distributions. Maximum values were obtained during late summer, and suggest that daily waste input is a minor source of nitrogen utilized by phytoplank-ton. The most productive area appears to be the null zone region of the estuary. In this region, the main channel does not have excessive phytoplankton concentrations that would lead to development of predominantly nuisance species or to serious dissolved oxygen deficiency. (Woodard-USGS) W77-08488

IMPLICATIONS OF SEASONAL CHEMICAL AND PHYSICAL FACTORS ON THE PRODUC-TION OF PHYTOPLANKTON IN NORTHERN SAN FRANCISCO BAY, Geological Survey, Menlo Park, Calif. Water

Resources Div.

D. H. Peterson, and T. J. Conomos.

D. H. Peterson, and 1. J. Conomos. In: Proceedings of a Workshop on Algae Nutrient Relationships in the San Francisco Bay and Delta, held at Clear Lake, California, November 8-10, 1973: The San Francisco Bay and Estuarine As-sociation, p 147-165, 1975. 4 fig, 3 tab, 56 ref.

Descriptors: *Phytoplankton, *Estuarine environment, *Bays, *California, *Nutrients, Phosphates, Nitrates, Nitronia, Seasonal, Distribution patterns, Chemical properties, Physical properties, Aquatic microorganisms. Identifiers: *San Francisco Bay estuary, Micronutrients, Seasonal fluctuations.

Northern San Francisco Bay, California, has a single summer-fall peak in phytoplankton cell abundance and productivity. The summer distribution of micronutrients in the main channel is con-trolled primarily by the distribution of phytoplankton: the highest abundance of phytoplankton persists in the inner regime (null zone) of the estuary and the lowest concentrations of micronutrients occur there. Under present conditions, if summer river discharge decreases and water residence time increases, the phytoplankton population should increase and the dissolved micronutrient concentrations decrease. Nitrogen can be depressed to growth-rate limiting concentrations only during periods of high phytoplankton abundance (during late summer). Increased insolation may increase productivity per unit area in both winter and summer, but increased availbility of nitrogen may increase productivity per unit area only in summer. (Woodard-USGS) W77-08489

RESPONSE OF OAT AND SPINACH TO SEWAGE SLUDGE APPLICATION IN SOIL, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Soils and Crops. S. I. Nahedh.

Available from the National Technical Informa-Available 110h the National Technical Information Service, Springfield, VA 22161 as PB-268 530, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis. September 1975. 141 p, 11 fig, 30 tab, 129 ref, 8 plates. OWRT A-038-NJ(1). 14-31-0001-

Descriptors: *Oats, *Spinach, *Sewage sludge, Salinity, Nitrogen, Phosphorus, Copper, Zinc, Crop response, Hydrogen ion concentration, Salts, Germination, Dissolved solids, Sludge disposal, Growth rates.

Identifiers: *Aerobic sludge *Anaerobic sludge.

A greenhouse study was conducted to determine the effect of sewage sludge amended soils on the growth of oats and spinach. Dissolved salts and pH effected germination and growth. The plants were analyzed for copper, zinc, nitrogen and phosphorus. The results of these experiments in which 0, 20, 40 and 80 T/A of aerobic and anaerobic sludges were used have indicated that spinach responded well to the anaerobic sludge applied to a Freehold sandy loam soil at pH 5 and 7. An increase in the yield over the control was obtained at all anaerobic sludge rates except at the 80 T/A. Apan anaerooic studge rates except at the 80 17A. Application of the aerobic sludge had an adverse effect on spinach yield, particularly when applied to pH 5 soil. The yield increased only after application of 20 T/A to the pH 7 soil. The oats yield increased with the 20 T/A application of the aerobic sludge to pH 5 soil, but the yield decreased drastically with more sludge applications to soils of either pH. The anaerobic sludge increased the yield only at the 40 T/A, then it either leveled off (at pH 5), or decreased (at pH 7) at the 80 T/A rate. The aerobic sludge was more effective in increas-The aerobic sludge was more effective in increasing yield than the anaerobic sludge. The aerobic sludge caused more uptake of phosphorus, nitrogen, zinc, copper by oat and spinach than the anaerobic sludge. The results also indicated that the aerobic sludge degraded rapidly in the soil, while the anaerobic sludge was more stable and did not decompose as rapidly. W77-08495

AVAILABILITY OF ALUMINUM PHOSPHATE COMPLEXES TO A GREEN ALGA IN VARIOUS CULTURE MEDIA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.

W77-08496

BACTERIAL GROWTH ON DISSOLVED OR-GANIC COMPOUNDS IN FRESH-WATER RESERVOIRS, (IN RUSSIAN), Akademiya Nauk SSSR, Moscow. Institut Biologii

Vnutrennykh Vod. For primary bibliographic entry see Field 5A. W77-08498

A PREDICTIVE PHOSPHORUS MODEL FOR LAKES - SENSITIVITY ANALYSIS AND APPLI-

LAKES - SENSITIVITY ANALYSIS AND APPLICATIONS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
W. J. Snodgrass, and C. R. O'Melia.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 607, Price codes: A03 in paper copy, A01 in microfiche. (1975). 29 p. 6 fig., 6 tab, 10 ref. Paper presented at 38th Annual Meeting of American Society of Limology and Oceanography, June 23-26, 1975, Dalhousie University, Halifax, Nova Scotia, Canada. OWRT A-074-NC(3). 14-31-0001-4033.

Pescriptors: Epilimnion, Hypolimnion, *Phosphorus, *Eutrophication, *Model studies, Nutrients, Cycling nutrients, Lakes, Analysis, *Forecasting. Identifiers: Predictive model for lakes, Sensitivity

Included are (1) a brief summary of a predictive model for phosphorus in lakes that has been developed and tested, (2) some additional verification of this model, (3) analysis of the sensitivity of model predictions to several model parameters, and (4) conclusions based on this sensitivity analyand (4) conclusions based on this sensitivity analysis. This model introduces two reactions which are usually not considered in limological investigations. First, a mean-depth dependent exchange of P across the thermocline is developed, based primarily on empirical evidence. Second, natural aggregation or flocculation of particles in lake waters is considered, based primarily on conceptual arguments. The model has been verified in two ways. First, model predictions of the effects of lake depth on eutrophication have been compared with Vollenweiger's observations (1968) and pared with Vollenweider's observations (1968) and gave good agreement. Second, predictions of the total phosphorus concentrations in lakes at the end of the winter circulation (TP) have been compared with field measurements made by other investiga-tors in several lakes. Agreement between pre-dicted and observed results was excellent. (Stewart-NC State)

THE SOLUBILITY OF PARTICULATE PHOSPHORUS IN THE EFFLUENT FROM ALUM TREATMENT OF WASTEWATER AND PHOSPHORUS SOLUTIONS, North Carolina Univ. at Chapel Hill. Dept. of En-

vironmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.
W77-08500

PHOSPHORUS EXCHANGE AT THE SEDI-MENT-WATER INTERFACE OF SELECTED NARRAGANSETT BAY SEDIMENTS, Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.

M. J. Petti.

Available from the National Technical Informa-Available Hold He National Technical Intolination Service, Springfield, VA 22161 as PB-268 622, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 89 p, 21 fig, 4 tab, 25 ref. OWRT B-052-RI(2). 14-01-0001-4123,

Descriptors: *Phosphorus, *Sediments, Nutrients, Bays, *Rhode Island, *Sediment water interfaces. Identifiers: *Nutrient flux, *Narragansett

In developing an understanding of water quality and its management, it is necessary to understand the materials balance or materials flux within a given water system. Among these materials are various pollutants, chemicals, gases, nutrients, biological communities, etc. The interaction of these materials (best described by the rate and exthese materials (loss described by the rate and ex-tent of reaction) governs the overall aging process of a water system. Such an aging process and the parallel process of eutrophication can proceed naturally or be accelerated artificially. The objec-tive of this study is to investigate an aspect of the

Group 5C-Effects Of Pollution

materials balance in Narragansett Bay, Rhode Island. The material of primary concern is phosphorus, and the process under consideration is nutrient flux. Nutrient flux or exchange of phosphorous at the sediment-water interface with the water column above, as determined in the laboratory, of selected bay sediments is described. Two series of experiments were conducted. Each experimental series is composed of microcosm studies performed in the laboratory. The first series studies the release and uptake of phosphorus, to and from the water column, by the sediments in aerobic and anaerobic environments and a constant flushing rate.

THE EFFECT OF SOLUBLE ORGANIC MATTER ON THE UTILIZATION OF PHENOXY HERBICIDES BY PSEUDOMONAS SP., Rhode Island Univ., Kingston. Dept. of Microbiology.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 528, Price codes: A04 in paper copy, A01 in microfiche. M. S. Thesis, 1975. 52 p. 11 fig. 9 tab, 21 ref. OWRT A-050-RI(2). 14-31-0001-5040.

Descriptors: Water pollution effects, Pollutant identification, "Pesticides, "Biodegradation, Metabolism, Herbicides, "Pseudomonas, Organic matter, "Microbial degradation, 2-4-D, 2-4-5-T, Organic compounds, Organic acids. Identifiers: 2-4-5-TP.

Eight organisms of the genus Pseudomonas were isolated from soil and water samples by conventional enrichment techniques. They were used to compare the microbial degradation of the three phenoxy herbicides: 2,4-dichlorophenoxyacetic phenoxy neroteues. 2-4-technologoactic acid (2,4-D), 2,4,5-trichloro-phenocyacetic acid (2,4,5-T), and 2-(2,4,5-trichlorophenoxy)-propionic acid (2,4,5-TP). 2,4,-D was readily attacked in a mineral salts medium by cultures adapted to this compound. The same concentrations of 2,4,5-T and 2,4,5-TP, however, were attacked only in the presence of a compound such as sodium benzoate, which served as a growth substrate. A comparison of cultures grown on benzoate and an herbicide, and on benzoate alone, showed no difference in cell yield. This suggests that no carbon or energy for growth was obtained from herbicide utilization, which is characteristic that the toxic and recalcitrant metabolite, 3,5-dichlorocatechol (3,5-DDC) accumulates during the cometabolism of 2,4,5-T. This might similarly hold true for 2,4,5-T. The intermediates, 3,5-DCC, and 2,4,5-trichlorophenol (2,4,5-TCP) were not detected in the culture medium during the study, however, it was demonstrated that increasstudy, nowever, it was defined and the state ing quantities of bacteriological peptone and beef extract (0.08 mg/ml or 0.40 mg/ml) increased the utilization of all three herbicides. This supplement provided only a small increase in growth however in the absence of sodium benzoate, 2,4,5-T and 2,4,5-TP utilization remained equally stimulated, but cell yield was much less. This indicates that the organic matter directly stimulated cell metabolism of the herbicides and did not simply increase growth. Beef extract and peptone contain substances known to be stimulatory to microbial metabolism. When added separately to cultures, these substances produced essentially the same effect. It seems that the 2,4,5-T and 2,4,5-TP were oxidized more extensively than previously reported. W77-08504

THE LIMNOLOGY OF A NORTH CAROLINA MILLPOND WITH SPECIAL REFERENCE TO HISTORICAL CHANGES AS EVIDENCED BY SEDIMENT CORE ANALYSIS,

North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering. C. F. Knud-Hansen. Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 624, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 67 p, 10 fig. 7 tab, 61 ref. 4 append. OWRT A-078-NC(1), 14-31-0001-5033.

Descriptors: *Eutrophication, Nutrients, Nitrates, Phosphates, *Tropic level, *Limnology, Water quality, Surface waters, Aquatic algae, Diatoms, *North Carolina, *Oligotrophy, Water pollution effects, Lake sediments. Identifiers: *Silver Lake(NC).

Silver Lake, built in 1785 in the Coastal Plain of North Carolina to run a corn mill, was found in 1974 to A moderately oligotrophic with respect to physical, chemical and biological parameters. Primarily due to a 623:1 drainage area to lake surface area ratio (75.1 square miles:77 acres), the calculated nutrient loading rates are 373.5 g N/m2/yr and 12.5 g P/m2/yr. These very high rates do not lead to eutrophic conditions presumbly because of an average detention time of 2.4 days, and little accumulation or retention of nutrients in this shallow (mean depth of 5.1 feet or 1.9 m) lake. Silver Lake was phosphorus limited as evidenced by the ratio of nitrogen to phosphorus loading as well as by the results of algal assay. A 13 cm lake sediment core was analyzed for oxidizable carbon, dry weight and diatom community structure at each centimeter of depth. A linear regression of the relationship between percent oxidizable carbon and number of diatoms per gram dry weight resulted in a negative correlation coefficient of 0.66. The dominant genera of diatoms shifted twice during the history of the lake. (Stewart-NC State)

FOREST FERTILIZATION AND WATER QUALITY IN THE NORTH CAROLINA PIED-MONT

North Carolina State Univ., Raleigh. School of Forest Resources. For primary bibliographic entry see Field 5B.

A METHOD FOR QUANTITATIVE DETERMINATION OF AMMONIFYING AND DENITRIFYING BACTERIA IN WATER WITH APPLIED EXAMPLES FROM GRAVEL-PIT POOLS, (IN CZECH),

Slovenska Akademie Vied, Bratislava (Czechoslovakia). Limnobiologisches Institut. For primary bibliographic entry see Field 5A. W77-08509

PERSISTENCE OF MYCOBACTERIUM BOVIS BCG IN SOIL AND ON VEGETABLES SPRAY-IRRIGATED WITH SEWAGE EFFLUENT AND SLIIDGE.

Public Health Service, Cincinnati, Ohio. Div. of Microbiology.
D. J. Van Donsel, and E. P. Larkin.

Journal of Food Protection, Vol. 40, No. 3, p 160-163, March, 1977. 3 fig, 1 tab, 20 ref.

Descriptors: Irrigation, *Sludge disposal, *Sewage effluents, Soil contamination effects, Microorganisms, Vegetation, Municipal wastes, Analysis, Waste water treatment, Public health. Identifiers: *Mycobacterium bovis BCG.

Land disposal of sludge is currently under consideration in the United States, and studies are being conducted on the potential public health hazards which might be inherent in this practice. Tubercle bacilli represent a particular threat because they generally survive conventional waste water treatment processes. Cultured Mycobacterium bovis BCG was added to activated sludge and to unchlorinated secondary effluent, which was then sprayed onto lettuce or radish plants grown outdoors in plywood boxes. Soil suspensions and vegetable washings were assayed for BCG. The

90% reduction time on effluent-sprayed radishes was 6 days, and on sludge-sprayed radishes it was 4 days, which was not a significant difference. The results for lettuce was too variable to permit estimation of survival rates. Consistent, low-level isolation of the organisms indicated that a certain amount had become attached to the plants. Washout of the inoculum from the plots by rainfall was apparently minimal. Soil temperatures were high during the test period, and heat probably killed many of the mycobacteria. The results must be interpreted with caution in view of the known large differences between mycobacterium grown in vitro and in vivo, and because of the numbers of tubercle bacilli found in urban sewage are very difficult to estimate. (Collins-FIRL)

CHLORINE COMBINING WITH SEWAGE, For primary bibliographic entry see Field 5D. W77-08571

5D. Waste Treatment Processes

REORGANIZING POLLUTION CONTROL IN THE U.K.

Wessex Water Authority, Bristol (England). For primary bibliographic entry see Field 5G. W77-08111

STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR THE EXPLOSIVES MANUFACTURING POINT SOURCE CATEGORY (PROPOSED RULES), Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W77-08113

OPERATION AND IMPACT OF NPDES IN RE-GION II, PART I, Environmental Protection Agency, New York.

Environmental Protection Agency, New Yor Caribbean Construction Grants Branch. For primary bibliographic entry see Field 5G. W77-08117

TOWARD CLEANER WATER IN THE PACIFIC NORTHWEST AND ALASKA--THE NATIONAL WATER PERMIT PROGRAM.

Environmental Protection Agency, Seattle, Wash. Public Affairs Office. For primary bibliographic entry see Field 5G. W77-08121 A si 4 in d T o h will hy m si si ti o ci m si ci m o V

SINF P fo J. K A tit P U N O P. P.

RECLAMATION OF ANTHRACITE COAL REFUSE USING TREATED MUNICIPAL WASTEWATER AND SLUDGE,

Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sopper, L. T. Kardos, and L. E. DiLissio.

W. E. Sopper, L. T. Kardos, and L. E. DiLissio. Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 666, Price codes: Ado in paper copy, A01 in microfiche. Research Publication 94, Institute for Research on Land and Water Resources, University Park, December 1976. 95 p, 62 tab, 21 fig, 74 ref, append. OWRT B-069-PA(5), 14-31-0001-4038.

Descriptors: *Sewage effluents, *Sewage disposal, *Revegetation, *Sewage sludge, Municipal wastes, Calcium, Phosphorus, Nitrogen, Legumes, *Grasses, Trees, *Pennsylvania, Water reuse, Vegetation effects, Waste disposal, Coal mine wastes, Recycling.

mine wastes, Recycling.
Identifiers: *Liquid digested sludge, *Anthracite mining refuse, Tension lysimeters, Ground cover.

The study determined the feasibility of using municipal sewage effluent and liquid digested studge to facilitate the revegetation of anthracite mining refuse. Four boxes, 4 x 32 x 4 feet deep, were

filled with anthracite coal refuse from a mining filled with anthracite coal refuse from a mining operation. The refuse was planted with eight species of trees, and seeded with eight species of both grasses and legumes. The boxes were then treated with sewage effluent and liquid digested sludge. Weekly percolate samples were collected at the 6 inch and 42 inch refuse depths with tension lysimeters. Treatments were applied for 19 weeks. Most tree species showed a significant response to treatment. The application of sludge appears to be necessary for successful establishment of a dense ground cover. Maximum grass and legume dry matter productions and percent areal covers were matter productions and percent areal covers were observed. Chemical analyses of the grasses revealed an increase in the content of nitrogen, phosphorus and calcium with each increase in fertilizer value of treatment. Application of treated domestic sewage increased the pH of the coal refuse at each level of treatment. Results indicate that revegetation of anthracite coal refuse is possible through the application of treated municipal wastewater. (Sink-Penn State) W77-08189

INVOLVEMENT OF FREE RADICALS IN THE CATALYTIC OXIDATION OF PHENOL IN AQUEOUS SOLUTION, Delaware Univ., Newark. Dept. of Chemical En-

gineering.
A. J. Sadana.

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Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 810, Ph.D. Thesis, June 1975. 194 p, 27 fig, 8 tab, 83 ref, 3 append. OWRT A-014-DEL(11).

Descriptors: Oxidation, *Catalysts, *Chemical reaction, *Phenol, *Kinetics, *Industrial wastes, Wastewater treatment, Ultimate disposal, Chemical wastes

Identifiers: *Aqueous-Phase Oxidation, *Wet Air Oxidation, *Catalytic oxidation, Free Radicals.

Aquueous-phase atalytic oxidation of phenol over supported copper oxide was studied from 369 to 452 degrees K and 14.7 to 250 psig oxygen pressure in batchwise mode. The reaction involves an in-duction period and a steady-state activity regime. duction period and a steady-state activity regime.

The initial rate is first order in phenol and one-half order in oxygen. Free radical involvement in the heterogeneously catalyzed oxidation of phenol was established. Reaction networks are similar for was estatosistic reaction networks are silinar to the heterogeneously and homogeneously cata-lyzed oxidation of phenol as far as quinones. Inter-mediates such as organic acids, which are ob-served in homogeneous oxidation, were not observed in the heterogeneouusly catalyzed oxidaoxidation removes organic carbon, initially charged as phenol, from solution efficiently amoderate temperatures and pressures. The less severe conditions required for aqueouus-phase actalytic oxidation of organics make it appear much more economical than non-catalyzed wet air oxidation. (Katzer-Delaware) W77-08201

SPRAY IRRIGATION OF TREATED MUNICIPAL SEWAGE EFFLUENT AND ITS EFFECT ON CHEMICAL PROPERTIES OF FOREST SOIL, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.

J. L. Richenderfer, W. E. Sopper, and L. T.

Kardos. Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 808, Price codes: A03 in paper copy, A01 in microfiche. USDA Forest Service General Technical Report OWAT C-5169(no. 4205)(1), B-001-PA (10), B-020-PA (15), B-047-PA (5), B-069-PA (2), and B-083-PA (1), L4-31-001-4205.

Descriptors: *Sewage effluents, *Forest soils, *Drainage water, Phosphorus, Boron, Manganese,

Sodium, Potassium, Chemical properties, Sewage disposal, Waste disposal, Waste water disposal,

Water reuse.
Identifiers: *Spray irrigation, *Land disposal, *Aland irrigation, *Sewage effluent disposal, Soil samples, Exchangeable hydrogen.

The Waste Water Renovation and Conservation Project at The Pennsylvania State University was begun to determine the feasibility and effectiveness of land irrigation as a method of municipal sewage effluent disposal. Irrigation was begun in 1963 on an old-field area, hardwood stand, and a pine plantation on Hublersburg silt loam soil. In 1965, irrigation was begun in a hardwood stand located on Morrison sand loam soil on State Game Lands. Soil samples were collected in the fall of 1963, 1967, and 1971. The samples were taken with a Veihmeyer tube by 1-foot depth increments to 5 feet. Of the 11 constituents analyzed, only potassium, sodium, manganese, exchangeable hydrogen, boron, and phosphorus had significant changes in concentration over time. Potassium, manganese, exchangeable hydrogen, and boron decreased sig-nificantly over time while sodium and phosphorus increased significantly over time. After 9 years of spray irrigation with treated municipal waste-water, there were no indications that the treatment had any detrimental effects on the soil. (Sink-Penn W77-08202

MATHEMATICAL AND EXPERIMENTAL IN-VESTIGATION OF NONSTEADY STATE THICKENING OF AN IDEAL SLURRY, Delaware Univ., Newark, Dept. of Civil Engineer-

J. B. McVaugh, Jr.
Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267 799, Price codes: A08 in paper copy, A01 in microfiche. M.S. Thesis, May 1975, 157 p. 33 fig, 7 tab, 47 ref, 4 append. OWRT A-025-DEL(3).

Descriptors: Sedimentation, *Sludge, *Sludge treatment, *Settling basins, *Laboratory tests, *Wastewater treatment, *Slurries, Water pollution control, Design, Suspensions, Sludge disposal, Separation techniques, Calcium carbonate, *Mathematical models.

Identifiers: *Thickening.

The purpose was to develop a mathematical model which could be used to describe non-steady state sludge thickening in a sedimentation tank or thickener in which zone settling takes place. The model was used in calculating such parameters as sludge bed depth and solids concentrations in thickener overflow and underflow, and was based on hypothetical overloading and underloading transients imposed on a continuous thickener set-tling a plastic bead slurry and a CaCo3 slurry. The model qualitatively described the behavior of the parameters when compared to the behavior predicted by solids flux theory. To test the validity of the model, a laboratory scale continuous thickener was constructed to settle a slurry of laboratory grade CaCo3. The thickener consisted of a plexiglass column 13.97 cm I.D. by approximately 265 cm height, with appropriate pumps and accesso-ries to conduct batch and continuous thickening experiments. (Dick-Delaware) W77-08207

STATUS OF REVERSE OSMOSIS DESALINA-

TION TECHNOLOGY,
Office of Water Research and Technology,
Washington, D.C. Membrane Processes Div. For primary bibliographic entry see Field 3A. W77-08225

YEAR ROUND COOLING WATER FROM THE COLD WEATHER OF WINTER, J. C. St. Clair

U.S. Patent No. 3,997,112, 5 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 953, no 2, p 618, December 14, 1976.

Descriptors: *Patents, *Cooling water, *Industrial water, *Irrigation, Irrigation water, Water pollu-tion sources, Reservoirs, Irrigation practices, Water reuse.

Cooling water at 39 deg. F is made available at low cost all year round by erecting towers in farmer's fields and spraying the water in the air around the towers to cool the water during the winter. The cooled water is collected and stored in a lake. During the summer the same towers and water spraying system is used to act as a permanent irrigation system with the water from the lake sprayed when needed on the farmer's crops. Since the use of the cold water from the lake for cooling water have to and can easily afford to pay for the whole system which includes a very good drainage system, farmers will greatly profit and therefore greatly favor the installation of such a system on their farms. With such a system the installers and owners of such a system can put polluting substances, in the irrigation water, that normally cannot be dumped in rivers, and the farmer's fields will act as a costless area where bacteria break down most polluting substances such as most industrial chemicals and sewage liquids. Electric lights can be installed on the towers and the farmers fields can be illuminated during the night and the crop yields in-creased by 10 to 25%. (Sinha-OEIS)

SANITARY AND HYGIENIC CHARAC-TERISTICS OF SUBSURFACE WATERS OF THE TSELINOGRAD AND TURGAI OBLASTS, (IN RUSSIAN), Tselinogradskii Meditsinskii Institut (USSR).

Dept. of General Hygiene. For primary bibliographic entry see Field 5B. W77-08253

THE ROLE OF PROTOZOA IN BIOLOGICAL PURIFICATION OF OIL INDUSTRY SEWAGE,

(IN RUSSIAN), Vsesoyuznyi Nauchno-Issledovatelskii Institut Neftekhmicheskikh Protsessov, Kiev (USSR). A. D. Strom, I. P. Danilevskaya, I. F. Tikhonruk, H. D. Vasilenko, and V. V. Vitli Nskaya. Gidrobiol Zh. 10(2), p 49-54, 1974.

Descriptors: *Protozoa, Water purification, *Biological treatment, Optimization, Sewage treatment, *Waste water treatment, *Oil wastes, Industrial wastes

An optimal technological system was developed for alkylphenol production waste purification. A relationship was found between the quality of the purified water and the number and variety of Protozoa. The experimental data were mathematically processed to establish optimal parameters for the purification process.—Copyright 1975, Biological Abstracts, Inc. W77-08254

METHOD OF PURIFICATION OF WASTE WATER BY TREATMENT WITH ZIRCONIUM

Shikoku Paper Mfg. Co. Ltd. (Japan). (Assignee). B. Ayukawa

U.S. Patent No. 3,997,439, 11 p, 5 ref; Official Gazette of the United States Patent Office, Vol 953, no 2, p 718, December 14, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Pulp wastes, *Water purifica-tion, Coagulation, Suspended solids, Chemical precipitation, Separation techniques, Pulp and paper industry. Identifiers: *Zirconium salts.

Group 5D-Waste Treatment Processes

This invention relates to a method for purification of water in which soluble octavalent polymer ca-tion forming water soluble zirconium salts are used to coagulate and precipitate suspended sub-stances and colloidal dispersed particles as well as non-colloidal dissolved organic and inorganic sub-stances in waste water. The object of the invention resides in complete removal of suspended sub-stances and colloidal dispersed particles as well as complete or partial removal of non-colloidal dissolved low molecular organic substances in the waste water derived from chemical pulping and paper mills so that oxygen demand and color are minimized and transparency is maximized in one process. (Sinha-OEIS) W77-08255

THE EFFECT OF DIFFERENT FLOCCULANTS ON THE ELIMINATION OF TRACE ELE-MENTS AND POLYCYLIC HYDROCARBONS IN THE WATER PURIFICATION PROCESS, (IN

Mainz Univ. (West Germany). Hygiene Institut. H. Kunte, J. K. Reichert, and J. Borneff. Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 158(6), p 530-540, 1974

Descriptors: *Trace elements, Flocculation, Organic compounds, Water purification, *Waste water treatment, *Metals, Filtration, Pilot plants. Identifiers: Trace metals, Metaloids, *Rhine Identifiers: Trace metals, Metaloids, River(Germany).

Water from the river Rhine was purified in a refiltration flocculator (pilot plant) using ferric chloride (30-36 g/m3), aluminum sulfate (70-100 g/m3), and 'ferri-Floc' (60-90 g/m3) as flocculants, the latter being a commercial product manufac-tured from residues of bauxite processing. The 3 substances, used at an optimal dosage, were equally efficient for reduction in turbidity, KMnO4 value, and concentrations of metals-metaloids. The elimination rate for the total of the 4 carcinogenic hydrocarbons 3,4-benzypyrene, 3,4-benzfluoranthene, 11,12-benzfluoranthene and indeno (1,2,3-cd) pyrene was 71-73% with ferric chloride, 80-87% with aluminum sulfate and 77-88% with 'ferri-Floc.' The most active carcinogen, 3,4-benzpyrene, was reduced by 90%. In all cases the concentrations after flocculation corresponded to values normally found in the ground water. Trace metals and metaloids were not affected in the same way. Only Ar, Hg, Fe, Mo and V were reduced in the majority of experiments. Cd, Cr, Co, Cu, Li, Ni, Pb, Se, Sr and Zn behaved dif-ferently. Since the raw water values were rather ese results can not be regarded as a failure of the flocculation process. At such low concentrations these elements probably can not be removed by any kind of flocculation, a complete removal is not even desirable because many have a biological function in the body.--Copyright 1975, Biological Abstract, Inc. W77-08256

KRAFT MILL RECOVERY SYSTEM,

Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y. (Assignee).

N. A. Fuller.

U.S. Patent No. 3,996,097, 3 p, 9 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 271, December 7, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Bleaching wastes, *Water reuse, Sodium chloride, Salts, Sodium compounds, Separation techniques, *Recycling.

During pulping operations, sodium chloride is dissolved in the pulping liquor and tends to remain in the chemical recovery cycle. Kraft pulping mills located in the interior or those supplied with logs which have not been salt water transported do not generally face this problem now; however, in the future, reuse of water to limit discharge of pollutants from a kraft mill may results in a significant buildup of sodium chloride in the recovery system. A precipitator catch containing sodium sulfate, sodium carbonate, sodium chloride and organic materials is removed from the precipitator to a slurry tank where sufficient water is added to produce a readily flowable or pumpable aqueous slurry. Carbon dioxide in an amount sufficient to convert the sodium carbonate to the less soluble bicarbonate is fed to the slurry by any suitable means, such as sparging, and the resultant slurry containing sodium sulfate, sodium chloride, sodium bicarbonate and organic materials which slurry is directed to a suitable filter and filtered to produce a filter cake containing essentially sodium sulfate and sodium bicarbonate, and a filtrate containing essentially sodium chloride. The filtrate is then removed from the system. (Sinha-OEIS) W77-08258

PRECOAT FOR PERMEABILITY SEPARATION

Universal Oil Products Co., Des Plaines, Ill. (Assignee). W. M. Conn.

U.S. Patent No. 3,996,131, 5 p, 4 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 282, December 7, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, techniques, Reverse osmosis, Membrane processes, Absorption, Clays, Activated carbon, Permeability.

Identifiers: Ultrafiltration processes.

The use of ultrafiltration and reverse osmosis for the separation or concentration of materials which include compositions such as greasy materials has been greatly restricted or entirely avoided. A system and composition which ensures the satisfactory operation of a reverse osmosis or ultrafiltration permanent membrane and system by effectively removing the hydrophobic and greasy materials before they can reach the membrane surface is disclosed. A composition comprising a clay or silicious absorbent or similar materials and activated carbon may be laid upon the membrane surface smoothly and evenly through the use of a normal pressure (i.e. up to 800 psi or more) and flow through-out the reverse osmosis or ultrafiltration system. Once deposited upon the membrane surface the composition will intercept the large large hydrophobic and undesirable molecules by absorption on the clay. Oily and other organic molecules, including dissolved materials likely to foul the membrane, will be adsorbed on the activated carbon. When the precoat layer is filled to capacity it is necessary to remove the precoat by respectively to the flushing procedure, the pressure is generally reduced and the velocity or flow rate of water being passed through the system is increased. It is helpful to follow the flushing step with a cleaning step by using a small amount of conventional laundry detergent which will remove much of the material which may have adhered to the membrane. (Sinha-OEIS) W77-08259

LIQUID WASTE TREATMENT APPARATUS. J. E. Prince, F. E. Terry, and W. H. Mullins. U.S. Patent No. 3,996,139, 4 p, 3 fig. 12 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 284, December 7, 1976.

Descriptors: *Patents, *Waste water treatment, *Water treatment, *Water pollution treatment, Water quality control, *Aeration, Oxygenation, Industrial wastes, Farm wastes, Equipment.

A self-contained extraction, aeration and return unit capable of intrusion into existing liquid circuits is provided. The unit can intrude either as a supplementing step, such as for boosting aeration-rates in existing aerating vessels, or as a prelimina-

ry step either immediately before the remaining treatment steps or at a geographically remote point which permits action of the oxygen in the waste liquid while enroute to a treatment plant. The invention is not limited to use in the treatment of sewage but has application in any liquid circuit where aeration is required such as reducing mineral content of potable water and aquaculture applications. In addition to its use as an oxygenating aerator, the unit or the preferred form of the aspirating aerator may be employed to infuse relatively cooler air into warm or hot waste liquid and thereby reduce the temperature of waste liquid. The unit includes an aspirator having an elongate mixing chamber downstream of the aspiration point and a liquid pump. (Sinha-OEIS) W77-08263

APPARATUS FOR CONTINUOUS LIQUID-LIQUID EXTRACTION OF WATER WITH A

Aktiebolaget Tellusond, Goteborg (Sweden). (Assignee). For primary bibliographic entry see Field 5F. W77-08264

SOURCES, CHARACTERISTICS AND TREAT-MENT AND DISPOSAL OF INDUSTRIAL WASTES CONTAINING HEX-ACHLOROBENZENE.

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TRW Systems and Energy, Redondo Beach, Calif. S. C. Ouinlivan, M. Ghassemi, and T. V.

Journal of Hazardous Materials, Vol. 1, No. 4, p 343-359, March, 1977. 1 fig, 9 tab, 11 ref.

Descriptors: *Chemical wastes, *Pesticides, *Toxicity, Industrial wastes, Solvents, Pesticide residues, Food chains, *Waste water disposal, *Waste water treatment, Environmental effects, Landfills, Incineration. Identifiers: *Hexachlorobenzene

Hexachlorobenzene (HCB) is a hazardous contaminant found in certain industrial wastes. It is toxic, has a potential for bioaccumulation in the food chain, and is stable physically, chemically, and biologically, enabling it to persist environmen-tally. The toxic effect of this chemical is chronic rather than acute, appearing most conspicuously as liver dysfunction. Serious incidents of environmental contamination have resulted from the mismanagement of wastes and products containing HCB. A study was therefore conducted to provide information on the major sources of wastes containing HCB, on the treatment and disposal methods used for these wastes, and on the cost of treatment and disposal. Of the 14 industry types identified as HCB producers, the pesticide and chlorinated solvents industries accounted for almost all HCB wastes, which amount to an estimated 4,305 tons per year. In producing Dacthal, PCNB, mirex, simazine, atrazine from chlorinated solvent production. The wastes are variously transported by forklift, truck, pipeline, heated tank trucks and rail. Prior to ultimate disposal they are stored as solid waste cubes under plastic cover and in water-covered lagoons. The disposal methods include land disposal, incineration, resource recovery, municipal sewage treatment, and atmospheric emission. Land disposal is the most prevalent method and can be environmentally acceptable with adequate soil covers of 4 to 6 feet, intermediate plastic layers to reduce the sublimation rate, and a sound geological site capable of containing leachates. Incineration with con-trolled emission, and by-product recovery appear to be the most desirable methods for destroying these wastes. Disposal cost data were not availa-ble. (Kutcher-FIRL) W77-08265

REMOVING EXPLOSIVES FROM WASTE-WATER,

College of Pe (Saudi Arabia). of Petroleum and Minerals, Dhahran

. K. Andren, R. McDonnell, B. Stevens, and J. M. Nystrom. Industrial Wastes, Vol. 23, No. 2, p 28-31, 49, March/April, 1977. 8 fig, 1 tab, 6 ref.

Descriptors: *Explosives, *Organic compounds, *Polymers, *Adsorption, Chemical wastes, Industrial wastes, Pilot plants, Toxicity, Activated carbon, Organic wastes, Waste disposal, *Waste water treatment. Identifiers: Nitrobodies, RDX, HMX, Trinitrotoluene, Dinitrotoluene.

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Pilot plant studies were run at the Iowa Ammunition Plant, Burlington, to establish the effectiveness of using a continuous polymeric adsorption process for removing traintrotulene (TNT), dinitrotoluene (DNT), and other hazardous nitrobodies, such as cyclotrimethylenetrinitramine (RDX) and cyclotrimethylenetetranitramine (HMX), from the waste streams of explosives production plants. These wastes contain highly colored, toxic, and explosive elements. Treatment methods employing neutralization, settling, dilumethylenetetranitramine methods employed programment methods employed neutralization, settling, dilumethylenetetranitramine methods employed neutralization neutralization neutralizationeutranitramine methods employed neutralization neutralization neu methods employing neutralization, settling, dilu-tion, and biological treatment are problematic or ineffective. Activated carbon adsorption will remove many organic materials, but its use for nitroaromatics is limited, as is its capacity for nitroaromatics is limited, as is its capacity for restoration. The polymeric adsorbent studied, Amberlite XAD-4, is composed of hard, non-porous resin beads resembling ion exchange resins but lacking ionic groups. This adsorbent can be regenerated for many cycles of operation and has a superior capacity for aromatic nitrobodies, although it is less effective for the non-aromatic DNY. The treatment process supersted would util. although it is less effective for the non-aromatic RDX. The treatment process suggested would utilize too parallel polymeric adsorption columns in a one-on, one-off mode. Two smaller polishing columns would be similarly operated. Recoverable solvent will regenerate the loaded adsorbent, leaving a concentrated aqueous sludge of explosive contaminants for ultimate disposal. This process would not remove all color, however; using the polymeric adsorbent and activated carbon as polishers in series would do so. The regenerated resin would remove residual RDX. The advantages of this treatment method are low chemical costs and substantially reduced solid waste disposal problems and hazards. (Kutcher-FIRL) problems and hazards. (Kutcher-FIRL) W77-08266

OZONE EFFECT OF SYNTHETIC RUBBER

OZONE EFFECT OF SYNTHETIC RUBBER WASTE TREATMENT, University of Southern California, Los Angeles. Environmental Engineering Div. K. Y. Chen, and R. W. Okey. Industrial Wastes, Vol. 23, No. 2, p 46-48, March/April, 1977. 5 fig, 2 tab, 3 ref.

Descriptors: *Ozone, *Organic compounds, Industrial wastes, Chemical oxygen demand, Rubber, Pilot plants, *Waste water treatment.

Tests were conducted on the use of ozone for treatment of wastes from synthetic rubber production in order to provide data for a 10 gpm pilot plant which was later designed, constructed, and operated on site. The possibility of using ozone was investigated due to the continued fouling of a was investigated due to the continued fouling of a water recovery evaporator employed after alum coagulation and sedimentation in the production of high quality process water. Experiments were performed and the results reported on the relationship between COD versus time in the ozonation of rubber and tire waste water at different standard cubic feet per hour bubbling rates. It was demonstrated that ozone treated effluents exerted substantial influence on oxygen untake, as compared stantial influence on oxygen uptake, as compared to untreated effluent. This suggests that ozonation of persistent organic compounds followed by conventional biological treatment may be a solution to the problem of treatment of many non-biodegradable organic compounds. The ozone reaction was found to be best certified out in the middle of transparent. found to be best carried out in the middle pH range of 6.0 to 8.5, sometimes necessitating a buffer system to maintain this pH level. (Kramer-FIRL) W77-08267

WASTE IMPOUNDMENT EFFICIENCY AT SUGAR MILL, K. M. St. PE.

Sugar Journal, Vol. 39, No. 11, p 25-26, April, 1977, 1 tab.

Descriptors: *Carbohydrates. *Biological treatment, *Organic wastes. processing industry, Aerobic treatment, Anaero-bic conditions, Lagoons, Biochemical oxygen de-mand, Dissolved oxygen, Industrial wastes, *Waste water treatment, Oxygenation, *Oxidation lagoons.

Identifiers: *Sugar mill wastes.

Sugar mill impoundment waters occasionally exhibit a low BOD5 of less than 10 parts per million along with an absence or small quantity of dissolved oxygen, ranging from 0.0 to 1.0 ppm. This solved oxygen, ranging from 0.0 to 1.0 ppm. Inis phenomenon occurs in impoundments where sun-light penetration is restricted by heavy vegetative growths. The bacterial action necessary for or-ganic waste decomposition is explained, and the gamic waste decomposition is explained, and the efficiency differences are illustrated for impoundments receiving direct sunlight and for those which do not. Sugar can be decomposed by anaerobic and aerobic bacteria. In ponds with high organic waste loads, anaerobic bacteria are used for the initial decomposition, but for discharge into state waters, a final aerobic stage is necessary. This requires free or dissolved oxygen, often obtained by mechanical aeration. Phytographton obtained by mechanical aeration. Phytoplankton obtained by mechanical aeration. Phytoplankton may also be used, at less expense to large mill impoundments than mechanical aeration. The phytoplankton need sunlight to produce oxygen photosynthetically. Where sunlight is not available the impoundment wastes remain unoxygenated, anaerobic bacterial growth is encouraged, the effluent has a low BOD5, and contains little oxygen. then has a low BOD5, and contains little oxygen. The results from tests with two ponds differing in sunlight and vegetation showed that the pond without vegetative-sunlight restrictions produced completely stabilized, well-oxygenated wastes, whereas the other one was less efficient in producing a high quality effluent. (Kutcher-FIRL) W77-08268

BACTERIOLOGICAL INVESTIGATION OF AL-BERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SALMONELLA ISOLA-

Environmental Protection Service, Edmonton

J. M. Vanderpost, and J. B. Bell. Applied and Environmental Microbiology, Vol. 33, No. 3, p 538-545, March, 1977. 1 fig, 8 tab, 22

Descriptors: *Bacteria, *Food processing industry, *Disinfection, *Salmonella, Municipal wastes, *Industrial wastes, *Waste water treatment, Treatment facilities, Membrane processes, Public health, *Isolation, *Canada, Bioindicators. Identifiers: *Meat packing plant wastes.

Eleven meat-packing plants in Alberta, Canada, were investigated to assess the occurrence and numbers of indicator bacteria and of Salmonella in their treatment facilities and final effluents. The purpose of the study was to help establish guidelines and standards for these effluents, and guidelines and standards for these effluents, and to determine whether disinfection is necessary. Municipal sewage in Alberta does not ordinarily undergo disinfection, so that organisms eventually are released to rivers. Washwater and manure are the sources of Salmonella in these plants. The effluent samples were tested by Standard Methods membrane filtration procedures. Results showed fluent samples were tested by Standard Methods membrane filtration procedures. Results showed that the bacteriological quality of final effluents was very poor, resembling raw sewage in the num-bers of indicator organisms, ranging from the hun-dreds of thousands to millions per milliliter. Prima-ry treatment using settling and floatation was inef-fective in reducing the number of bacteria. While secondary treatment reduced the bacteria by 99%, it could not be clearly determined that this treatment had much influence on Salmonella reduction.

Salmonella were found in the final effluents of 78% of the plants, including the one using secondary treatment. The 21 Salmonella serotypes isolated did not resist antibiotics. Some of the coliform and fecal coliform isolates were resistant to the antibiotics chloramphenicol, tetracycline, and ampicillin. There is a concern that this resistance might be transferred to Salmonella. Disinfection of the wastes could prevent this potential health hazard. (Kutcher-FIRL) Salmonella were found in the final effluents of

OCCUPATIONAL CHARACTERISTICS AND BIOLOGICAL KINETIC CONSTANTS OF EXTENDED AERATION PROCESS,

Asian Inst. of Tech., Bangkok (Thailand).
P. Y. Yang, and Y. K. Chen.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 678-688, April, 1977. 12 fig, 6 tab, 14

Descriptors: *Kinetics, *Aeration, *Waste water treatment, *Food processing industry, Activated sludge, Organic compounds, Chemical oxygen demand, Biological treatment.

Identifiers: *Extended aeration.

A study is presented of investigations into the performance of a continuous-flow extended aeration system meant to treat soluble organic waste water system meant to treat soluble organic waste water from soft drink bottling plants. The aeration systems were tested with and without the assistance of partial chemical hydrolysis for sludge recycling. In both cases, the biological kinetic constants evaluated were the yield con-stant, the specific organism decay rate, the saturation concentration, and the maximum growth rate. With hydrolysis, a 75% reduction in sludge production was obtained; the maximum growth rate decreased 64.5%, and the specific organism decay rate decreased 65.6%. Several wastes from different soft drinks and from milk were used to evaluate these constants. It appears that the type of organic waste rather than the substrate concentration is most important in varying the constants. It was concluded that if the average biochemical It was concluded that if the average biochemical removal efficiency, in terms of COD, is greater than 96.2%, soluble organic effluents can be treated by the extended aeration activated sludge processes, with total sludge recycling. Using acid hydrolysis applied to a portion of the return sludge can maintain the biological solids concentration within a certain range. It can also produce a nitrified effluent which will enhance the endogenous oxygen uptake rate and the specific substrate utilization rate of the sludge. (Kutcher-FIRL) FIRI) W77-08270

CLOSED-LOOP SYSTEM SEPARATES OIL FROM PREWASH OVERFLOW, Miller Brewing Co., Milwaukee, Wis.

D. Erwin.

Industrial Wastes, Vol. 23, No. 2, p 26-27, 50, March/April, 1977. 1 fig.

Descriptors: *Oil wastes, *Metals, *Aluminum, Industrial wastes, *Waste water treatment, *Recycling, Water reuse.
Identifiers: Closed-loop systems, *Brewery canning wastes.

A closed-loop system is described which separates oil from the prewash rinse water of the aluminum can finishing process at the Miller Brewing Comcan trinsming process at the filter brewing Company. The prewash stage generates up to 50% of the waste overflows; 90% of the oil can be removed by this closed system which also provides for the recirculation of water. A water electrolyte solution is sprayed onto the cans to break down the oil emulsion with which they are coated. The oil-laden overflow is passed into a cylindrical tank with a truncated top. The oil is then directed to a top-mounted recovery belt from which the oil is scraped; it is next discharged to a holding tank

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for reclamation. The rinse water, now free of oil, for reclamation. The rinse water, now tree of oil, is returned to the prewash stage. The tank can be periodically purged of dirt, solids, and electrolyte accumulations. Blowdowns of 100 to 200 gpd are adequate to keep the loop clean. The system is controlled automatically to maintain the desired two percent electrolyte concentration, and to assure an oil/water interface variation in the separation tank of not more than one half inch. This keeps the water below the oil removal belt and the oil level high enough for optimum contact with the belt. The advantages of this system are reduced water and chemical consumption, and the recovery of oil for reuse or sale. (Kutcher-FIRL) W77-08271

REDUCTION OF MERCURY, COPPER, NICKEL, CADMIUM, AND ZINC LEVELS IN SOLUTION BY COMPETITIVE ADSORPTION ONTO PEANUT HULLS, AND RAW AND AGED

Francis Marion Coll., Florence, S. C. Dept. of Chemistry and Physics.

R. W. Henderson, D. S. Andrews, G. R. Lightsey, and N. A. Poonawala.

Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 3, p 355-359, March, 1977. 1 fig, 2 tab, 11 ref.

Descriptors: *Organic compounds, *Waste water wastes, Industrial wastes, *Mercury, *Copper, *Nickel, *Cadmium, *Zinc, Heavy metals, Toxicity, Metals, Ions.
Identifiers: *Peanut hulls, Bark, *Metal ions.

Organic matter in waste water is oxidized in mu-nicipal plants by bacteria. When industrial and municipal wastes are combined, the bacteria are rendered ineffective by the metallic ions often contained in the wastes. A study was therefore conducted to test the ability of low-cost organic residues in removing toxic metal ions from waste water. Raw and composted southern pine bark and peanut hulls were tested for their capacity to adsorb mercury, copper, nickel, cadmium and zinc. Peanut hulls were able to adsorb significant quantities of all the metals. The smaller the peanut hull particle size, the greater the amount of metals adsorbed. At high metal concentrations they removed 117 mg metal/g solid, or 11.2% of the total. At lower concentrations, 24.4% of the metals were removed. Copper was removed to a moderate degree when pine bark was the adsor-bent, but other metals were not. Composted bark, however, adsorbed large percentages of all the metals except for mercury and zinc in low concentrations. Using organic residues might be a practical way of handling wastes when only occasional shock loads are expected. Otherwise, the standard methods of ion-exchange, activated carbon, and reverse osmosis would be required. (Kutcher-W77-08272

PERFORMANCE OF DUAL-MEDIA FILTERS-

Standard Oil Co. (Ohio), Cleveland. M. A. Brody, and R. J. Lumpkins. Chemical Engineering Progress, Vol. 73, No. 4, p 83-86, April, 1977. 4 fig, 2 tab.

Descriptors: *Filtration, *Oil wastes, *Suspended solids, *Pilot plants, Industrial wastes, Activated sludge, *Waste water treatment, Activated carsludge, *Waste water ben, *Filters, Pennsylvania. Identifiers: *Refinery wastes, *Dual media filters.

The waste water treatment plant at the refinery of the BP Oil Corporation in Marcus Hook, Pennsylvania, consists of API separators, surge basins, sand filters, and an activated carbon adsorption system. There are also sludge handling and de-watering facilities for treating the sand filter backwash, the API separator bottoms, and the emulsion breaker bottoms. The filters receive a flow of 1500 to 2000 gal/min containing suspended solids and oil concentrations ranging from 50 to 150 mg/liter. Three filters operating in parallel comprise the sand filter unit. The top layer of the filter media is two and a half feet of anthracite; the bottom layer is a four and a half foot layer of sand. bottom layer is a four and a nan root layer of sanc. The operation and control systems of the filter unit are described in great detail. The system is fully automated. Hydraulic-operated valves direct the flow to the filters. The control system records flow, indicates differential pressure, and records surge basin levels. The unit was designed for each filter to handle a maximum flow rate of 1000 gal/min. The efficiencies were to be a 77% removal of suspended solids and a 79% removal of oil. Over a three year period, the actual average reduc-tions have been about 60% for both suspended solids and oil. (See also W77-08274) (Kutcher-W77-08273

PERFORMANCE OF DUAL-MEDIA FILTERS--

Imperial Oil Enterprises, Ltd., Sarnia (Ontario). J. C. Kempling, and J. Eng. Chemical Engineering Progress, Vol. 73, No. 4, p 87-91, April, 1977. 7 fig, 1 tab, 5 ref.

Descriptors: *Filtration, *Oil wastes, *Suspended solids, *Pilot plants, Industrial wastes, Activated sludge, *Waste water treatment, Maintenance. Identifiers: *Dual media filters, *Refinery wastes.

Two different applications of dual-media filtration systems for refinery effluents are presented and evaluated. In one pilot simulation study, the filters were used to remove the residual biofloc from the secondary treatment effluent of an aerated lagoon. The suspended solids removal was 80%, and the BOD removal reached 50%. Other pilot tests were run for filtering the effluent of an API separator to remove the oil and suspended solids. The Imperial Oil refinery at Sarnia, Ontario, constructed a fullscale filter based on the pilot data. Comparisons are presented of the pilot design estimates and the filter plant after 20 months of operation. The dualmedia filter consisted of anthracite on top of a sand layer. Filtration took place in the lower section; filtered water was stored in the upper tank. The filter can treat 6000 gal/min of waste water. Results from the plant showed a 79% reduction in oil, with a feed concentration of 56 mg/liter and a product concentration of 12 mg/liter, whereas the pilot filtration unit showed a 75% reduction, from 33 mg/liter of oil to 8 mg/liter. For suspended solids, the plant showed a reduction of 54%, representing a drop from 43 mg/liter of suspended solids to 20 mg/liter. The pilot unit concentration dropped from 25 mg/liter of suspended solids to 12 mg/liter, or 55%. Thus the full-scale unit compares quite favorably with the pilot. During the 20 months, the filter provided consistent and maintenance-free service, while averaging a combined oil and suspended solids removal of 1.5 tons per day. (See also W77-08273) (Kutcher-FIRL)

TREATMENT OF AQUEOUS CONDENSATES AND EFFLUENTS FROM COKING PLANTS-WITH ALKALI SALTS OF WEAK ACIDS, TO EXPEL AMMONIA. Netherlands Patent NL 7607-273. Issued February 25, 1977. Derwent Netherlands Patents Abstracts,

Vol. Y, No. 10, p D2, April, 1977.

Descriptors: *Patents, *Ammonia, *Waste water treatment, Chemical wastes, Recycling, Industrial Identifiers: *Coking plant effluents.

A patent was issued for a process to drive off ammonia from the aqueous condensates resulting from the coking of coal, lignite, bitumen shale and peat. It can also be used to remove ammonia from low temperature carbonization gases. The fluids containing ammonia are combined with low-

volatility strong acids and mixed with aqueous solutions of carbonates or sulfides, or their hydrogen compounds, or with cyanides or the polysulfides of alkali metals. With this process, soluble salts of the strong acids are formed. NaOH or KOH solutions can be used as the treatment fluid after they have been used to remove H2S from coke oven gas. The spent sodium hydroxide solution is then pumped to an ammonia stripper; the remaining condensate from the coke oven gas is recycled to the first stage. (Kutcher-FIRL) W77-08275

IS PH PRETREATMENT NECESSARY, Wesleyan Univ., Middletown, Conn. Industrial

April, 1977. 1 fig, 6 ref.

J. W. Masselli, N. W. Masselli, and M. G. Burford. Textile Industries, Vol. 141, No. 4, p 66a, 66c, 67,

Descriptors: *Waste water treatment, *Textiles, *Tannery wastes, *Alkalinity, *Organic com-pounds, *Treatment facilities, Industrial wastes, demand, Effluents, Biochemical oxygen de *Hydrogen ion concentration.

Identifiers: *Pretreatment(Industrial wastes), Cotton mills

In the treatment of wastes from cotton mills and tanneries which contain alkaline (10-12) pH levels, the method of neutralizing these pH levels by pretreating with organic acids is not recom-mended. Laboratory experience with highly alkaline textile and tannery wastes indicated that ac-tivated sludge processes will automatically nor-malize influents with pH's between 12 and 13, with no pretreatment needed. Examples are cited of a Cranston Print Works plant in Fletcher, North Carolina, a Warwick, Rhode Island treatment plant, and a New England cotton mill in which pretreatment with organic acids produced no useful benefits, created undesirable odors, did not aid treatability, and increased the costs of the finished goods. An alkaline pH of the plant wastes is desirable due to: the prevention of equipment corrosion; neutralization of acid wastes; prevention of hydrogen sulfide odors; prevention of hydrogen cyanide evolution; emulsification of grease, preventing pipe blockages; and increase in clarification during primary sedimentation. These wastes are automatically neutralized and converted to bicarbonate alkalinity, an excellent buffer for the 6.5 to 9.0 pH range. It was suggested that if problems are expected due to a low BOD/alkalinity ratio, acid might be added directly to the mixed liquor for the simplest and least expensive method of control. (Kramer-FIRL) W77-08276

PURIFYING BIOLOGICAL EFFLUENT RICH IN CARBOHYDRATES OR PROTEIN-BY ANAEROBIC FERMENTATION SEPARATION, AEROBIC TREATMENT AND THEN SEPARA-

French Patent FR 2308-598 Issued December 24 1976. Derwent French Patents Abstracts, Vol. Y, No. 8, p D4, April, 1977.

Descriptors: *Patents, *Biological treatment, *Carbohydrates, *Proteins, Anaerobic conditions, Aerobic treatment, Food processing industry, Industrial wastes, *Waste water treatment, Fermentation, Sludge treatment, Recycling.

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A patent was issued for a biological treatment process for aqueous effluents rich in car-bohydrates or protein. These wastes are commonly found in sugar, starch, and jam factories. The liquid is first treated during an anaerobic fer-The liquid is first treated during an anaerobic fermentation stage. The methane formed from this phase is removed. The first sludge concentrate, obtained by separation, is recycled for further anaerobic fermentation. The remaining liquor is returned for aerobic treatment. This step is repeated in obtaining a second sludge concentrate. The process is stable, easily operable, and eliminates problems of sludge settling and residual organic compounds containing nitrogen. (Kutcher-FIRL) W77-08277

CHARACTERIZATION AND TREATMENT OF TEXTILE DYEING WASTEWATERS, Crompton and Knowles Corp., Reading, Pa. R. H. Horning. Textile Chemist and Colorist, Vol. 9, No. 4, p 24-27, April, 1977. 5 tab, 3 ref.

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Descriptors: *Textiles, *Dyes, *Industrial wastes, *Waste water treatment, Adsorption, Pollutant identification, Organic compounds, Color, Heavy metals, Lime.

metals, Lime.

A study with a threefold purpose was conducted on waste waters from the textile industry. The waste waters were characterized; evaluated for biological oxidation, carbon adsorption, chemical oxidation, and chemical coagulation; and examined for treatability with combination methods. Twenty combinations of fiber class/construction, dye, and application methods were selected as representative for the industry. The wastes were analyzed for cadmium, copper, chromium, lead, phenol, benzidine, and chlorides. The heavy metals levels were low in the tested wastes except where a metal figured in the bath formulation. Benzidine averages are difficult to obtain. Although the results from these tests showed an average value of 11.5 micrograms per liter, in actuality the value is probably much lower. Biological treatment proved very effective in removing BOD5 and it inhibited nitrification for many samples. It was much less effective for TOC removal, indicating the presence of non-biodegradable matter, and not at all effective for color removal. No single treatment effectively removed both TOC and color. Precipitation was tested with lime, alum and ferric iron salts; powdered activated carbon was used for adsorption: for oxidation ozone TOC and color. Precipitation was tested with lime, alum and ferric iron salts; powdered activated carbon was used for adsorption; for oxidation ozone was used. For waste waters of carbonate alkalinity, lime was useful, allowing the formation of calcium carbonate. Coagulation procedures were best in decolorizing disperse, vat, and sulfur dyes, while carbon was best used for reactive, basic, and control to the control of the carbon was best used for reactive. while carroin was best used for reactive, basic, acid, and azoic dyes. Reactive and basic dyes were easily decolorized with ozone treatment at doses of one gram per liter, but disperse dyes did not respond favorably to this treatment. Tables are presented for all dye classes and treatment methods. (Kutcher-FIRL)

EFFECT OF ACCLIMATION TO LIME-SUL-FIDE EFFLUENT FROM UNHAIRING CATTLE-HIDES ON THE COMPOSITION OF AC-TIVATED SLUDGE,

Agricultural Research Service, Philadelphia, Pa. Eastern Regional Research Center.
W. F. Happich, J. E. Cooper, E. H. Bitcover, M. M. Taylor, and J. W. Harlan.
The Journal of the American Leather Chemists Association, Vol. 72, No. 4, p 120-135, April, 1977.

Descriptors: *Activated sludge, *Tannery wastes, *Industrial wastes, Biodegradation, Heavy metals, Microorganisms, *Waste water treatment. Identifiers: *Lime-sulfide effluent, *Waste analy-

Experimental processes and results are described for modifying the composition of activated sludge from sanitary wastes to full strength, lime-sulfide unhairing effluent during bio-oxidation. Acclimation is defined as the adaptation and growth of activated sludge microorganisms to and in the limesulfide effluent. The methods for harvesting the acclimated-activated sludge and the analytical methods used in the experiment are detailed. Analyses are made of the recovered activated and acclimated-activated sludges for their inorganic composition. The acclimated-activated sludge was

analyzed spectrographically. Data are given for the amino acid composition in activated sludge. Acclimated-activated sludge had a protein content of 30 to 36% while activated sludge contained 28 to 32% protein. Acclimation increased ash, inorganic 32% protein. Acclimation increased ash, inorganic sulfur compounds, and protein sulfur. Free amino acids, which were not present in activated sludge, were found in the acclimated-activated sludge, Lanthionine, a component in the lime-sulfide effluent, could be used as an indicator of the presence of alkal-degraded hair protein. Toxic heavy metal contaminants were absent from the acclimated-activated sludge and because of its protein content, it might be useful as an animal feed supplement; it could also be used as a high-lime fertilizer. (Kutcher-FIRL) W77-08279

SPLIT-STR®AM CHEMICAL TREATMENT (A PATENTED PROCESS BY CHEMLAN COMPANY, INC.) OF TANNING INDUSTRY WASTE WATER.

The Leather Manufacturer, Vol 94, No 4, p 12, 15, 16-18, 21-22, 27, 30-31, April, 1977. 1 fig. 3 tab.

Descriptors: *Tannery wastes, *Chemical wastes, *Sludge treatment, Recycling, Flocculation, Oxidation, Suspended solids, *Waste water treatment, Industrial wastes.

Identifiers: *Chappell Process(Tanning wastes), *Split stream chemical treatment.

The Chappell Process, an innovative approach for the chemical-physical treatment of waste water from the tanning industry, is described. Operable in either the batch or continuous flow-through mode, it is based on the split-stream technique and allows for massive sludge recycling. Raw waste is discharged from a receiving tank in two separate streams, one of which receives acid treatment and streams, one of which receives acid treatment and the other alkaline treatment. Rapid oxidation of dissolved and suspended solids occurs at the pH extremes in each stream. When the streams recombine in a pipe leading to the floculation tank, the oxygen demand has already been satisfied, and neutralization then takes place. The aluminum used to alter the pH precipitates at this point as an hydroxide and it is recycled for further dissolution in the two streams. The stream flows to tanks for mixing with residual sludge already formed by the process and for precipitation. Whatever sludge is not recycled is removed from the ever sludge is not recycled is removed from the whole system for disposal. (Kutcher-FIRL)

BACTERIAL GROWTH KINETICS IN THE COMPLETELY MIXED ACTIVATED SLUDGE TREATMENT OF FELLMONGERY EFFLUENT, Rhodes Univ., Grahamstown (South Africa).

Dept. of Microbiology.
D. E. Rawlings, and D. R. Woods.
Water Research, Vol 11, No 3, p 281-288, 1977. 9 fig, 1 tab, 17 ref.

Descriptors: *Kinetics, *Activated sludge, *Tannery wastes, *Bacteria, *Waste water treatment, Laboratory tests, Industrial wastes, Mathematical models, Suspended solids. Identifiers: *Fellmongery wastes.

A kinetic study has been performed for fellmongery lime-sulfide effluent, in which the microbial growth is compared with that of domestic sewage. Fellmongery and tannery waste waters are complex mixtures, characterized by their high (11-13) pH and sulfide (700 to 2000 mg/liter) concentrations. A laboratory scale completely mixed activated sludge (CMAS) reactor with sludge recycle and controlled wasting was used to treat the fellmongery effluent. Effluent quality was significantly affected by varying the sludge age. Microbial growth in the treatment process was described by a mathematical model which may be used to design and operate effluent treatment facilities. design and operate effluent treatment facilities. Several equations which comprise this model are

provided. In the development of the model it was demonstrated that a clear distinction must be made between volatile suspended solids and active volatile suspended solids in order to accurately describe the microbial growth kinetics. (Kramer-TED) W77-08281

AIR FLOTATION OF OILY WASTE WATERS WITH ORGANIC COAGULANTS, California Univ., Berkeley.

R. G. Luthy.

Available from the University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No 77-4519. PhD Thesis, 1976. 181 p.

Descriptors: *Flotation, *Oil wastes, *Waste water treatment, Flocculation, Pilot plants, Organic compounds, Polyelectrolytes, Costs. Identifiers: *Refinery wastes.

An attempt was made to identify the conditions for removing emulsified oil from refinery waste waters by using organic coagulants. The emulsion properties affecting oil droplet flocculation and flotation were also studied. The water quality rather than the oil source is the influential factor on oil droplet properties. Tough, interfacial films, or electrical effects, or solid material adsorption at the oil-water interface create stable emulsions. It was demonstrated that a 15 mg/liter dose of 75% charged polydiallydimethylammonium polymer could remove up to 10 mg/liter of oil from API separator effluents. Large oil droplet removal was not affected by underdosing. Oil removal was best not attected by underdosing. Oil removal was best when the polymer dose gave a net zero oil droplet charge, in conjunction with efficient polymer bridging between the oil droplets. Good flocculation resulted in good flotation. Although polyelectrolyte treatment is costly, the expense is offset by savings in sludge disposal costs and by the value of the recovered oil. (Kutcher-FIRL)

TAKING ACRES OUT OF POLLUTION-CON-

Metcalf and Eddy, Inc., Boston, Mass. R. C. Atwood, W. A. Peterson, and C. W. Bowers. Textile World, Vol 127, NO 4, p 125-126, April, 1977, 1 tab.

Descriptors: *Textiles, *Biological treatment, *Recycling, *Industrial wastes, *Waste water treatment, Water reuse, Water pollution control,

Potential cost savings through in-plant modifica-tions and controls for the textile industry are out-lined. These include the reduction of process water; the reuse of cooling, printing, and effluent waters; the recovery of several agents; the han-dling of effluents; and the cleaning of waters. In-plant controls may be the installation of liquid level control devices in tanks and baths, or of flow, pH, and temperature indicators on feed lines and process tanks. Wash and rinse temperatures and process tanks. Wash and rinse temperatures may be better optimized and reductions may be ef-fected in water consumption by tailoring flow to fabric width. Chemical substitution and reuse can fabric width. Chemical substitution and reuse can both reduce pollutant concentration and offer savings in process chemical costs. Modifications in effluent handling may be performed in the pre-treatment, in-plant, and end-of-pipe phases of treatment. Additionally, equipment is suggested for optimally cleaning the waters, such as trickling filters and rotating biological discs. Other important processes include activated sludge; extended aeration, which is an activated sludge modification; aerobic, anaerobic or aerobic/anaerobic lagooning; and physical-chemical treatment techniques. Such systems have been compared in terms of their treatment of textile effluents and it was shown that chemical coagulation and biological systems were most effective in the removal of suspended solids, BOD, COD, TDS, bacteria, color, pH, metals, and nutrients. By designing

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strategies for process-water and chemical con-sumption, reuse, and treatment to meet the specific needs of the mill facility, effluent require-ments should be economically met. (Kramer-FIRL) W77-08283

ROOT GROWTH, STRENGTH, AND CHEMI-CAL PROPERTIES OF A HOBSON FRAGIPAN, Missouri Univ., Columbia. Dept. of Agronomy. For primary bibliographic entry see Field 2G. W77-08285

CHELATING AGENT ANALYSIS BY HIGH SPEED LIQUID CHROMATOGRAPHY, Missouri Univ., Columbia. Dept. of Chemistry. For primary bibliographic entry see Field 5A. W77-08286

DETECTION OF PHOSPHATE ADSORPTION ONTO COAL HUMIC ACIDS,

Missouri Univ.-Columbia. Dept. of Chemistry. For primary bibliographic entry see Field 5A. W77-08294

NETWORK EVALUATION OF WASTEWATER COLLECTION ECONOMICS, Northwestern Univ., Evanston, Ill. Dept. of Civil

Jarir S. Dajani.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 082, Price codes: A09 in paper copy, A01 in microfiche. PhD Thesis, June 1971. 183 p. OWRT A-042-ILL(3). 14-31-0001-3513.

Descriptors: Economics, Waste water treatment, Costs, Optimization, Input-output analysis, Evaluation, Networks, Cities, Model studies, Sewers, Treatment facilities, Methodology. Identifiers: *Network evaluations, *Wastewater collection systems, *Cost functions, Urban development, Cost models.

Urban public services are a significant component of the overall urban system. These services are composed of both nodal (the production and processing functions) and network (the delivery or collection functions) components. Very little is known about their cost functions. Wastewater collections of the control of the c lection services are used to show how technologi-cal relationships and principles of micro-economics can be used to generate cost functions for service networks with a public works content. A wastewater collection network is broken down to the sewerline satisfying a linear demand. Then its economics, application of optimization and in-puts and outputs are explored. Cost functions are derived from both hydraulic formulae and cost equations. Optimization, present design methodology and recent developments in network layout and design are then explored. The optimal choice is fitted to a convex programming framework. A 160-acre experimental module is presented as a basis for the development of nor-mative network cost models. Minimum-cost wastewater collection networks were designed and their costs estimated for these theoretical modules. By using relationships between cost, area, population density and treatment plant cost information, items such as; tradeoffs between net-work and nodal costs, minimum-cost size of total surface area, and the overall service cost functions were exposed. The implications of the different methodologies and models are presented and the conceptual frameworks are outlined. (Gemmell-II-W77-08331

OPTIMAL LAYOUT AND DESIGN OF STORM SEWER SYSTEMS. Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering. L. W. Mays.

Available from the National Technical Information Service Springfield, VA 22161 as PB-268 049, Price codes: A11 in paper copy, A01 in microfiche. Ph. D. thesis, 1976, 224 p, 48 fig, 21 tab, 3 append, 32 ref. OWRT C-4123(No. 9023) (4). 14-31-0001-

Descriptors: *Optimization, Urban drainage, Environmental engineering, *Dynamic programming, Hydraulics, *Storm drains, *Sewers, *Design criteria, *Model studies, Costs, Pipes, Cities. Identifiers: *Urban development, Computer applications, *Discrete differential dynamic programming.

An optimization model has been developed for the minimum cost layout and design of storm sewer systems. This model can be used to determine the optimal layout, size, and crown elevations of the sewer pipes and depths of the manholes. The optimization is achieved by using a screening model consisting of two conjunctive phases: a model for the combined layout and design and a supplemen-tary design model for prescribed layouts. The combined layout and design model is an optimization procedure based upon discrete differential dynamic programming (DDDP) which simultaneously varies both the system layout and pipe design. Drainage lines, which are imaginary lines separating manholes for investigation of possible pipe connections, are used to divide the system into stages for optimization. At each stage of the DDDP procedure, a connectivity model, which is formulated as a set-partitioning problem, is solved to determine the minimum cost layout for that stage. The combined layout and design model is an iterative stage by stage procedure resulting in a complete system layout and design after each iteration. When changes in the system layout occur for successive iterations of the combined model, the design model for given layouts is used to compute the optimal design of the previously generated layout by the combined layout and design model. The design model is also an iterative stage-by-stage optimization procedure based upon DDDP. The hydraulics of flow are accounted for by using Manning's equation and peak flows at various manhooles are added to compute flowrates for the connecting downstream pipes. W77-08334

PROCESS DESIGN OF SINGLE-SLUDGE ACTIVATED SLUDGE SYSTEMS USING NITRATE

New York State Dept. of Environmental Conservation, Albany: and Rensselaer Polytechnic Inst.,

C. Beer, and L. K. Wang.
New York State Dept of Environmental Conservation, Technical Report No. 50, May 1977, 40 p., 6 fig., 4 tab, 16 ref. Presented at the 49th Annual Meeting of the New York Water Pollution Control Assoc., Jan. 17-19, 1977, New York City.

Descriptors: *Wastewater treatment, *Activated sludge, Performance, *Desig *Respiration, *Denitrification, Nitrates, *Design, Nitrogen, Treatment facilities. Identifiers: *Nitrate respiration, *Process design.

The flow sheets discussed have two characteristic features: (a) Utilization of nitrates as hydrogen acceptor occurs during part of the process. (b) There is not addition of an external carbon source to bring abut denitrification. Wastewater carbon compounds or the biomass of the sludge or both are used as hydrogen donor. The increased capability of removing nitrogen is one remarkable aspect of the flow sheets discussed, other noteworthy aspects are: better solids removal, better alkalinity control, energy conservation, and the possibility of using the final settler as sludge thickening device. W77-08336

TREATMENT OF WASTEWATER FROM MILI-TARY EXPLOSIVES AND PROPELLANTS PRODUCTION INDUSTRY BY PHYSICOCHEMICAL PROCESSES

Rensselaer Polytechnic Inst. Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environ-

mental Engineering. L. K. Wang, W. W. Shuster, R. W. Shade, and T.

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L. K. Wang, W. W. Shuster, R. W. Shade, and T. J. Lynch.
Available from the National Technical Information Service, Springfield, VA 22161 as AD. A027329, Price codes: A08 in paper copy, A01 in microfiche. Prepared for Army Mobility Equipment R&D Command, Ft. Belvoir, VA, Final Project Report, June 1976. 121 p., 38 fig., 6 tab, 63 ref. RPI-JBA02. DAAG-53-75C-0252.

Descriptors: *Wastewater treatment, Activated carbon, Polyelectrolytes, Coagulation, Filtration, Centrifugation, Adsorption, *Military aspects, Nitrates, Industrial wastes. Identifiers: *Nitrocellulose-manufacturing waste-

water, *Cellulose nitrate.

Laboratory and pilot-plant studies were conducted to investigate the effectiveness of various physi-cal-chemical processes for the separation of nitrocellulose (i.e., cellulose nitrate) from a military wastewater. Special emphasis was placed on in-line filtration (i.e., contact-coagulation-filtration), precoat filtration and conventional multimedia filtration. Three conventional treatment systems tration. Three conventional treatment systems were feasible for removing at least 94% of turbidity: (a) using 200 mg/l of Cat-Floc alone as coagulant; (b) using 100 mg/l of Cat-Floc as coagulant and 100 mg/l of Bentonite clay as coagulant aid; and (c) 200 mg/l of Cat-Floc as coagulant and 750 mg/l of powdered activated carbon (Darco S-51) as coagulant aid as well as adsorbent. Another treatment method involving centrifugation was also investigated. Although direct centrifugation of the raw nitrocellulose-manufacturing wastewater could not reduce any turbidity, the combination of chemical coagulation (using cationic polyelectrolyte as coagulant and appropriate material as coagulant aid) and centrifugation could achieve more than 98% of turbidity removal. W77-08337

INVESTIGATION OF THE EFFECTIVENESS OF POLYMERS IN THE TREATMENT OF NIROCELLULOSE-MANUFACTURING

Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering. L. K. Wang, R. W. Shade, W. W. Shuster, and F.

Bilgen.
Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD-A023602, Price codes: A101 in paper copy, A01 in microfiche. Prepared for Army Mobility Equip-ment R&D Command, Ft. Belvoir, Va., Final Pro-ject Report, March 1976. 153 p., 72 fig., 7 tab, 36 ref. RPI-JBA02, DAAG-53-75C-0252.

Descriptors: *Waste water treatment, Military aspects, Activated carbon, Polyelectrolytes, Ad-sorption, Lime, Coagulation, Filtration, Colloid charge, Chemical precipitation, Nitrates, *Polymers, Industrial wastes. Identifiers: *Nitrocellulose-manufacturing waste-

water, *Cellulose nitrate.

The effectiveness of organic polymers in the treat-ment of two types of industrial wastewaters has been investigated. The experimental study con-sisted of initially performing batch coagulation tests followed by continuous filtration runs with the wastewater, using the results obtained in the batch tests. six polymers were used in the experi-ments to determine optimum type and dosage required for effective turbidity removal. The best method selected for the treatment of wastewater consisted of the addition of 100 mg/l Cat-Floc ca-

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tionic polymer and 100 mg/l of powdered bentonite tionic polymer and 100 mg/101 powered centonic clay to the wastewater in a batch unit and after sedimentation, filtration of the supernatant at a flow rate of 4 gpm/sq ft. This treatment yielded a high quality filtrate with a 99.8% reduction in turbidity.

W77-08338

ROLE OF POLYELECTROLYTES IN THE FILTRATION OF COLLOIDAL PARTICLES FROM WATER AND WASTEWATER, Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.

Polytechnic Inst., Troy, N.Y. Dept. of Environ-mental Engineering.
W.W. Shuster, and L. K. Wang.
Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD-A027
330, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Army Mobility Equip-ment R and D Command, Ft. Belvoir, Va., Final Project Report, June 1976, 51 p., 4 fig., 194 ref. RPI-JBA02, DAAG-53-75C-0252.

Descriptors: Waste water treatment, *Water treatment, *Filtration, *Polyelectrolytes, Coagulation, Filters, Colloids

Identifiers: Multi-media filtration, Colloidal parti-

An extensive review has been made of the literature in connection with the use of polyelectrolytes in the removal of colloidal particles from water and wastewater by mechanisms of filtration. Pertinent literature on the nature of colloidal materials and current theory related to particle interactions and coagulation has been briefly reviewed. Per-tinent literature on the nature of colloidal materials and current theory related to particle interactions and coagulation has been briefly reviewed. Physical aspects and the chemical aspects of filtration have been considered. References related to the characterization and behavior of multi-media filters as well as single media filters were included. Particular attention was directed to the review and evaluation of articles related to specific applications of the use of polyelectrolytes in water treatment, and in domestic and industrial wastewater treatment. W77-08339

FORWARD OSMOSIS EXTRACTORS. Arizona Univ., Tucson. School of Renewable Natural Resources.

For primary bibliographic entry see Field 3A. W77-08340

AN ECONOMIC APPRAISAL OF REUSE CON-CEPTS IN REGIONAL WATER SUPPLY PLANNING.

Utah State Univ., Logan. Dept. of Economics. R. Narayanan, B. C. Jensen, A. B. Bishop, and K.

Available from the National Technical Informa-Available Holm Technical Technical Holman tion Service, Springfield, VA 22161 as PB-268 093, Price codes: A04 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Logan, Publi-cation PRWG123-3, April 1976. 63 p, 6 fig, 7 tab, 6 append. OWRT B-097-UTAH(2), 14-31-0001-4133.

Descriptors: *Water reuse, *Water supply development, Water supply, *Planning, *Recycling, *Utah, Economics, *Regional analysis, Model studies, Mathematical models, Computer models, Risks, Optimization, Water allocation tion(Policy).
Identifiers: *Salt Lake County(Utah).

Using a conceptual model of a water supply firm, the necessary conditions for production and mar-ket efficiency are derived when renovated wastewater is considered as a potential water resource. The nature and extent of the supply augmentation due to recycled reuse is demonstrated using classical optimization techniques. Three stages of shortrun supply corresponding to no recycling, partial recycled reuse and complete recycling of all reclaimable water are identified through appropriate Lagrangian multipliers as well as graphitechniques. A mathematical programming model is structured to determine the optimal water resource allocation and pricing policy for Salt Lake County. By maximizing the sum of consumer and producer surplus (the difference between total willingness-to-pay and total cost) economically efficient equilibria are derived. The feasibility of recycled reuse for municipal purposes is examined in a planning context. The impact of higher water quality discharge standards on the attractiveness of water recycling option is studied. To ensure social acceptability of renovated wastewater for culi-nary purposes, blending restrictions are imposed, which stipulate that the amount of water for reuse be less than a fixed percentage of the water from other sources. The effects of such a constraint on the prices and water allocation are delineated. The hydrologic uncertainty in water supply is treated using stochastic programming techniques. The resulting changes in pricing and allocation policies are discussed. W77-08347

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS, Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W77-08356

W77-08357

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY PRETREAT-MENT STANDARDS.

Environmental Protection Agency, Washington, For primary bibliographic entry see Field 5G.

EFFLUENT GUIDELINES AND STANDARDS FOR CANNED AND PRESERVED FRUITS AND VEGETABLES POINT SOURCE CATEGORY. Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W77-08371

THE 1972 WATER POLLUTION CONTROL ACT: UNFORESEEN IMPLICATIONS FOR LAND USE PLANNING.

For primary bibliographic entry see Field 5G. W77-08373

PUBLIC HEARING REGARDING 180-DAY NOTICE TO THE SANTA FE LAND IMPROVE MENT COMPANY OF VIOLATION OF STATE AND FEDERAL WATER QUALITY STAN-DARDS FOR THE INTERSTATE WATERS OF THE KANSAS AND MISSOURI RIVERS, HELD AT KANSAS CITY, KANSAS ON 13 JULY 1971. For primary bibliographic entry see Field 5G. W77-08381

EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR NEW SOURCES FOR THE SIANDARDS FOR NEW SOURCES FOR INC.
SULFITE, SODA, DEINK AND NON-INTEGRATED PAPER MILLS SEGMENT OF THE PULP, PAPER, AND PAPERBOARD POINT SOURCE CATEGORY.

Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W77-08383

FULL SCALE OPERATION OF PLUG FLOW ACTIVATED SLUDGE SYSTEMS,

New York State Dept. of Environmental Conservation, Albany; and Rensselaer Polytechnic Inst., Troy, N.Y.
C. Beer, L. J. Hetling, and L. K. Wang.

New York State Dept of Environmental Conservation, Technical Report No 42, Aug 1975, Presented at the New England Water Pollution Control Association Meeting, Hartford, Conn., October 23, 1974, 45 p. 13 fig. 7 tab, 16 ref. EPA Project 17050

Descriptors: *Waste water treatment, *Activated sludge, *Performance, *Operations, sludge, *Performance, *Operations,
*Nitrification, *Denitrification, *Treatment facilities, *Oxidation, Phosphorus, Absorption, Chemical precipitation, Aeration, Nitrogen.
Identifiers: *Phosphorus removal, Waste assimilation(Nitrogen).

Six unit processes are involved in the plug flow ac-tivated sludge plant: (a) organic carbon removal by oxidation (substrate respiration); (b) organic carbon removal by assimilation (sludge production); (c) nitrogen removal by denitrification using internal hydrogen donors (H-Donors); (d) nitrogen removal by assimilation (sludge production); (e) phosphorus removal by biological uptake; and (f) phosphorus removal by precipitation, with metal ions. One characteristic feature of the process described is its high sludge production per pound of BOD removal: approximately 0.8 lbs of VSS. Approximately 52% of the nitrogen received in the plant reappears in the sludge wasted. It appears feasible to operate a nitrogen removal process at the comparatively low sewage aeration time of six hours. W77-08451

RECLAMATION AND USE OF DISTURBED LAND IN THE SOUTHWEST. For primary bibliographic entry see Field 5G. W77-08452

AVAILABILITY OF ALUMINUM PHOSPHATE COMPLEXES TO A GREEN ALGA IN VARI-OUS CULTURE MEDIA, North Carolina Univ. at Chapel Hill. Dept. of En-

vironmental Sciences and Engineering.

J. C. Matheson, III. Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-268 510, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 119 p, 16 fig, 10 tab, 68 ref, append. OWRT A-075-NC(1). 14-31-0001-4033.

Descriptors: Algae, Assay, *Phosphates, Phosphorus, *Eutrophication, Tertiary treatment, Aluminum, Nutrients, Nutrient removal, *Cycling nutrients, Bioassay, *Chlorophyta, *Waste water

Identifiers: Algal assay, *Aluminum phosphate, Phosphorus removal, *Selenastrum capricornu-

The availability of phosphate contained in alum floc as a nutrient for algal growth was assessed in culture conditions that simulated natural waters receiving alum floc overflowing from tertiary wastewater treatment facilities. Potassium salts of phosphate were flocculated with alum and com-pared in unialgal cultures of Selenastrum capricornutum (Printz) with unflocculated potassium phosphate, a commercially available mixture of variscite and metavariscite (mineral aluminum phosphate), and 'P-free' controls for support of algal biomass. Culture conditions controlled pH within the pH 7-8 range in some media and went within the pH 7-8 range in some media and went higher in others. Media were formulated such that the importance of 'artificial' cultural variables, that is, presence of EDTA and pH buffering systems, and 'real world' variables, that is, ther-modynamically determined equilibrium concentra-tions and flocculation conditions, could be com-pared relative to one another for their control of

Group 5D—Waste Treatment Processes

aluminum phosphate complex availability. algal assay system was a reasonable model of a agai assay system was a reasonate indeet of a natural aquatic system with respect to alum-floc-culated phosphate availability. Under all culture conditions, alum-flocculated phosphate was large ly or entirely available to Selenastrum as a phosphorus source. In tests of the mineral aluminum phosphate mixture, very slow or no growth was observed. This difference in availability probably resulted from more rapid dissolution of phosphate from amorphous 'hydroxo aluminum phosphate' than from the crystalline form, a variable that could possibly be controlled by floccula-tion conditions and floc aging. (Stewart-NC State)

THE SOLUBILITY OF PARTICULATE PHOSPHORUS IN THE EFFLUENT FROM ALUM TREATMENT OF WASTEWATER AND PHOSPHORUS SOLUTIONS,

North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.

B. A. Dempsey.

B. A. Dempsey. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-268 519, Price codes: A05 in paper copy, A01 in microfiche. M. S. Thesis, May 1975. 67 p, 20 fig, 4 tab, 57 ref. OWRT A-075-NC(2). 14-31-0001-4033.

Descriptors: *Nutrient removal, Cycling nutrients, Phosphorus. Aluminum, **Eutrophication** *Tertiary treatment, Algae, Chelation, water treatment, Solubility.

Identifiers: *Phosphorus removal,

Identifiers: *Phosphorus removal, *Alum precipitation, Algal growth, Chelating agents, Phosphorus cycling, Alum treatment.

The effluent from alum treated wastewater streams and the decanted supernatant from alum precipitated phosphorus solutions contain a particulate fraction that is made up of aluminum and phosphorus. These naturally suspended com-plexes were diluted into pH, temperature, and ionic strength controlled receiving waters. In all cases, filterable reactive phosphorus in the receiving water reached a plateau concentration within 24 hours. Diluted effluent from the wastewater stream solubilized less than 10 ug/l filterable reactive phosphorus between pH 6.0 and 7.2. Diluted supernatant from alum-precipitated solutions solubilized greater than 10 ug/l at all pH values. Filterable reactive aluminum concentration was measured in certain experiments, and pKsp's calculated for ALPO4 and AL(OH)3. Effects of other parameters on the solubility of aluminum-phosphorus complexes are reported. (Stewart-NC W77-08500

INVESTIGATION OF COAGULATION - PRECIPITATION AND ULTRAFILTRATION FOR THE REGENERATION OF BRI THE CUCUMBER PICKLE INDUSTRY, North Carolina Univ. at Chapel Hill. Dept. of En-

vironmental Sciences and Engineering. L. F. Horney.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 651, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 50 p, 7 fig, 10 tab, 36 ref. OWRT A-079-NC(1), 14-31-0001-4033.

Descriptors: *Food processing industry, Brine disposal, "Coagulation, "Waste water treatment, Industrial wastes, "North Carolina, Water reuse, "Chemical precipitation.

Identifiers: *Ultrafiltration, Cucumber pickles, Brine regeneration, *Brine reuse, Food processing wastes, Coagulation-precipitation, *Pickle indus-

Brine wastes in the cucumber pickle industry was studied, and regeneration of these wastes for subsequent reuse was considered the most feasible method of treating these wastes. One of the major factors in the reuse of brines is the necessity to remove the softening enzyme, polygalacturonase, syn. pectinase. Two methods of regeneration were studied in detail: (1) chemical coagulation-precipitation with lime and NaOH to pH 11.5 followed by neutralization with acetic acid and (2) ultrafiltration. The former method was tested on 11 different spent brines to determine amounts of chemicals needed and to analyze brine characteristics before and after precipitation. Spent brine and 36-hr brine samples were filtered through a range of ultrafilter pore size in two modes, in series and in parallel, to determine the ultrafilter size necessary for pectinase rejection. PM10 and UM2 gave the best rejection. While both types of treatment remove pectinase activity without affecting the salinity, neither significantly lowered other or-ganic materials as measured by TOC and COD. (Stewart-NC State) W77-08511

HEALTH CONSIDERATIONS IN USE OF TER-TIARY EFFLUENTS.

California Univ., Berkeley. Dept. of Biomedical and Environmental Health Sciences. For primary bibliographic entry see Field 5F.

STATE OF THE ART IN SEWAGE TREAT-MENT PLANT CONTROL, Lund Inst. of Tech. (Sweden).

G. Olsson.

In: Chemical Process Control, Foss, A. S., and Denn, M. M., Editors, AIChE Symposium Series, Vol. 72, No. 159, p 52-77, 1976. 5 fig, 126 ref.

Descriptors: *Reviews. *Waste water treatment. *Treatment facilities, *Automatic controls, Instrumentation, Chemical treatment, Analytical treatment, Monitoring, Computers, Performance, Tertiary treatment, Design criteria, Model studies, Biological treatment, Sludge treatment, Chemical properties, Biological properties, Physical properties. Flow, Biochemical oxygen demand, Dissolved oxygen.

Waste water treatment is a non-profit industry where there is little incentive for designing an optimal cost-effective system. For this reason and because of inherent difficulties in treatment methods, there is a lack of information on the benefits and costs of automatically controlled treatment. Sewage treatment plants are centered on the removal of contaminants which are vastly varied and of such small concentrations that few have measurable levels. This is the major obstacle to designing instrumentation for control purposes. Influent and effluent qualities are measured by BOD, COD, TOC, total phosphorus, nitrogen, suspended solids, trace metals, trace organics, pesticides, and viruses. Selection of relevant information for control and instrumentation is a must, but the lack of dynamic models to determine essential variables places a real limitation on sensors and equipment. Temperature variations from seasonal changes also affect control efforts. The spatial distribution of sedimentation basin concentrates, and the changes in character of biological reactor processes also present control problems. Process design and control system design should be considered in treatment system design; collection systems should be operated so that flow rate or water quality changes can be predicted early and flow to the plant can be controlled. The application of various models for design, flow prediction, and routing were explored, as were current operational practices. Control and monitoring were illustrated through descriptions of the activated sludge process, settler dynamics, dissolved oxygen control, biological systems, water quality ystems, phosphorus removal by chemical orecipitation, and in-plant computer use. (Collins-W77-08515

CONFIRMATION OF THE SINGLE-STEP MEM-BRANE FILTRATION PROCEDURE FOR ESTI-MATING PSEUDOMONAS AERUGINOSA DEN-SITTES IN WATER, Canada Centre for Inland Waters, Burlington

(Ontario).

For primary bibliographic entry see Field 5A. W77-08518

ENTEROVIRUS TYPES IN ISRAEL SEWAGE. Hadassah Medical School, Jerusalem (Israel). For primary bibliographic entry see Field 5A. W77-08519

RAPID AGAR POUR-PLATE TECHNIQUE FOR DETECTION AND ENUMERATION OF FAE-CAL COLIFORMS IN SEWAGE, National Environmental Engineering Research Detective true training traini

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Inst., Nagpur (India). For primary bibliographic entry see Field 5A. W77-08520

IMPROVED METHOD FOR THE DETERMINA-TION OF ETHYLENEDIAMINETETRAACETIC ACID IN AQUEOUS ENVIRONMENTAL SAM-PLES BY GAS-LIQUID CHROMATOGRAPHY, Water Pollution Research Lab., Stevenage (England).

For primary bibliographic entry see Field 5A. W77-08521

CLAY ADSORPTION TREATMENT OF NON-IONIC SURFACTANTS IN WASTE WATER, Delware Univ., Newark. Dept. of Civil Engineer-

J. G. Carberry, C. J. Twardowski, and D. K. Eberhart

Journal Water Pollution Control Federation, Vol. 49, No. 3, p 452-459, March, 1977. 11 fig, 4 tab, 11

Descriptors: *Adsorption, *Clays, *Surfactants, Separation techniques, Physical properties, Chemical properties, Analysis, *Waste water treatment, Evaluation, Particle size. Identifiers: *Clay adsorption treatment.

Non-ionic surfactant adsorption studies were con ducted using clays. Bentonite clays were found to adsorb 10 to 20 times better than activated carbon on a weight basis of surfactant removed per weight of adsorbent. Three clays which were able to remove non-ionics from waste water were Mineral Colloid 103, Accofloc 352, and Bentolite L. Mineral Colloid 103 had the best adsorptive capacity. Higher interaction energies were found for liquid non-ionic surfactants than those predicted for gases. Micelle formation and deposition might account for such large interactions with ad-sorptive surfaces. Accofloc 352 had the lowest interaction energy and might be the easiest to regenerate. A decrease in adsorptive capacity was found in continous flow studies as compared to determinations from batch isotherm studies. This was partially due to increased bed particle size to allow gravity flow through the column. Mineral Colloid 103 had the largest adsorptive capacity in continuous flow studies. No studies of regeneration of clay surfaces, or economic comparisons of batch treatment or gravity flow through fixed columns were attempted. (Collins-FIRL) W77-08522

REVERSE OSMOSIS ON SECONDARY EFFLUENT: THE EFFECT OF SEWAGE RECOVERY,

Australian Atomic Energy Research Establishment, Lucas Heights. R. Wechsler.

Water Research, Vol. 11, No. 4, p 379-385, 1977.6 fig. 1 tab, 5 ref.

Descriptors: *Reverse osmosis, *Treatment facili-ties, *Performance, Salinity, Pilot plant, *Sewage treatment, Aeration, Sedimentation, Membrane processes, Chemical oxygen demand, Organic matter, Economics, *Waste water treatment, Aus-

The effects of reverse osmotic recovery on plant performance and product quality was evaluated in a pilot scale municipal waste water reclamation plant in Australia. Raw sewage was comminuted and screened, passed to grit chambers and prearation tanks, moved to primary settling tanks, and passed to a step aeration activated sludge plant where waste sludge was recycled to pre-aeration tanks. The secondary effluent was passed to a canal system. The effluent was passed to the reclamation plant where chemical clarification and reverse osmosis with optional granular carbon polishing took place. The reverse osmosis plant consisted of two macroscopic tubular modules polishing took place. The reverse osmosis plant consisted of two macroscopic tubular modules having membranes annealed at 80 and 86 C, respectively. Brine velocity was 120 cubic metrs/second under a brine loop pressure of 40 atmospheres, and a temperature of 25 C. Results indicated that the product salt concentration increased as the plant recovery increased. Its organic component concentration did not significantly increased. The flux game component concentration due not signifi-cantly increase when recovery increased. The flux decline rate did not prohibit recovery if the crystallization of hardness causing substances was prevented. Lime clarification was recommended if prevented. Line charincation was recommended in recovery was to be reasonably economical. Clean-ing by depressurization and sweet water flushing, daily, maintained membrane productivity at 90% of maximum. Cleaning was not affected by plant recovery. It was concluded that the salt concentrarecovery. It was concluded that the salt concentra-tion tolerated by the product, and not the rate of flux decline or organic matter concentration, limited recovery. Because of the cost of prior treatment steps, it was suggested that reverse os-mosis be operated at maximum daily recovery. (Collins-FIRL)

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TREATMENT OF HIGH STRENGTH ACIDIC WASTE WATER WITH A COMPLETELY MIXED ANAEROBIC FILTER,

Illinois Univ. at Urbana-Champaign. Dept. of Civil

Engineering. E. S. K. Chian, and F. B. DeWalle. Water Research, Vol. 11, No. 3, p 295-304, 1977. 10 fig, 1 tab, 23 ref. EPA 68-03-0162.

Descriptors: *Filtration, *Anaerobic conditions, *Biological treatment, *Alkalinity, Sludge treatment, *Waste water treatment, Filters, Chemical oxygen demand, Suspended solids, Organic matter, Hydrogen ion concentration, Heavy metals, *Filters.

Identifiers: *Mixed anaerobic filters.

High strength acidic waste water was treated with a completely mixed anerobic filter. The waste water was a leachate typical of that in solid waste landfills, containing free volatile fatty acids and complex high molecular weight carbohydrate-like organics. Treatment by the mixed anaerobic filter was successful, and eliminated the costs of buffer solutions needed with plug flow anaerobic filters. solutions needed with plug flow anaerobic filters. Heavy metal toxicity was counteracted by adding sulfides. The system's response to increased organic loading and shockloads was quite good. A hydraulic detention time above 7 days produced high percentages of organic matter removal. Methane gas leaving the unit indicated a low bacterial solids manufacture, accounting for 93% of the COD removed. About 0.12 grams of volatile suspended solids were removed for each gram of COD removed. No nutrient additions were required because of the low solids production and mitial anaerobic sludge seeding. (Collins-FIRL) W77-08524

OXYGEN AERATION AT NEWTON CREEK, New York State Dept. of Water Resources, New York.

N. Nash, P. J. Krasnoff, W. B. Pressman, and R.

O. Dienner.
Journal Water Pollution Control Federation, Vol.
49, No. 3, p 388-400, March, 1977. 4 fig, 6 tab. EPA
Project 11010 GEV.

Descriptors: *Aeration, *Oxygen, Activated sludge, Treatment facilities, Performance, Sewage effluents, Biochemical oxygen demand, Suspended solids, Microorganisms, Sludge treatment, *Waste water treatment, New York. Identifiers: *Newton Creek(NY).

Plant-scale tests have indicated that pure oxygen substituted for process air can upgrade overloaded activated sludge plants. This method was further examined at the Newton Creek, New York, modified aeration plant. Over the three-year test period, effluent quality averaged 19 milligrams/liter of both BOD and total suspended solids, at flow rates of 38,200-134,000 cubic metalloads. solids, at flow rates of 38,200-134,000 cubic meters/day. The equivalent removal efficiencies were 89% for BOD and 86% for suspended solids. Effluent quality was slightly poorer during warm weather, non-filamentous periods, although overall efficiency was slightly greater at those times. During four cold weather periods when funding all organisms proliferated the effluent quality dropped. The predominant fungus that caused recurrent difficulties in winter was identified as Geotrichum. The concentration of filamentous organisms in the system affected process efficiency. ganisms in the system affected process efficiency in a proportional manner. Oxygen consumption averaged 1.0 grams/gram of BOD removed at, or above, design flow rates. At these levels, the power requirement averaged 0.95 kilowatt-hours per kilogram of BOD removed. During filamenper anoglam of BOD removed. During filamen-tous periods, solids production averaged 1.27 grams/gram of removed BOD, and 0.93 grams dur-ing nonfilamentous periods. (Collins-FIRL) W77-085226

AEROBIC DIGESTION OF WASTE AC-TIVATED SLUDGE AT LOW TEMPERATURES, British Columbia Univ., Vancouver. Dept. of Civil Engineering.

D. A. Koers, and D. S. Mavinic. Journal Water Pollution Control Federation, Vol. 49, No. 3, p 460-468, March, 1977. 8 fig, 12 ref.

Descriptors: *Sludge digestion, *Aerobic condi-tions, Temperature, Activated sludge, *Waste water treatment, Sludge treatment, Treatment facilities, Biological treatment, Microorganisms, Biochemical oxygen demand, Oxygen, Hydrogen ion concentration, Chemical properties, Physical properties.
Identifiers: *Aerobic digestion.

A study was conducted on the design and operating criteria of aerobic digestion systems handling activated sludge under cold climate conditions. Comparative data were generated for operation at various low temperatures. A field evaluation of laboratory results was the final part of the study. Study temperatures were 20, 10 and 6 C. Results indicated little difference between continuous and semi-continuous digester operations. The major exception was a volatile suspended solids (VSS) reduction at 5 C with the semi-continuous digester method. There was a good correlation between the product of sludge age and temperature and VSS reduction after this product exceeds 250. At low temperatures, a 50-day sludge age results in the maximum VSS reduction of nearly 30%; 5 C is the lowest average monthly digester temperature. Full-scale operations were too variable for steady-state conditions to be established. Mixed liquor BOD was thought to be a promising parameter for measuring digested sludge stability during storage when odor is used as a criterion for stability. Sludge with a BOD5 of less than 9.29 grams/gram of VSS was odor-free after storage at 20 C. Stabilization was achieved at a sludge age of 40 days at 20 C, and at 60 days at 10 C, but not even 80 days achieved sludge stability at 5 C. Cell mass characteristics, reduction at 5 C with the semi-continuous digester

measured by TOC, COD, organic nitrogen, and volatile content, was extremely constant for all systems. Biodegradability seemed to decrease with increased sludge age. The basic composition of the sludge cells did not appear to change during aerobic digestion. (Collins-FIRL) W77-08527

DEWATERING: A NEW METHOD BOWS, Ecodyne Corp., Kans. Smith and Loveless Div. J. A. Bell, R. Higgins, and D. G. Mason. Water and Wastes Engineering, Vol. 14, No. 4, p 33-34, 39-41, April, 1977. 5 fig, 10 tab, 2 ref.

Descriptors: *Dewatering, *Filtration, *Sludge treatment, Equipment, Polyelectrolytes, Performance, Evaluation, Treatment facilities, Polymers, Chemical treatment, Sedimentation, Tertiary treatment, *Waste water treatment. Identifiers: Gravity pressure filtration, Aerobic disection.

A gravity-pressure filtration system, or sludge concentrator, has been developed to dewater sludges from various treatment processes and especially, to take advantage of polyelectrolyte-conditioned sludge characteristics. The concentrator is provided with a sludge feed pump, a polymer system, a sludge conditioning system, and a two-stage dewatering unit. A combination flashmixerstage dewatering unit. A combination riasimizer flocculator provides optimum mixing of the diluted polymer and sludge to form large particles prior to gravity dewatering. In the pressure stage, three sets of compression rollers squeeze out more liquid and the dewatered sludge is discharged for final disposal. Sludge volume can be reduced as much as 80%. Models are provided which can process up to 1600 dry pounds of sludge/million gallons in a 40 hour week. Comparisons with vacuum filtration indicated that a 250-square foot vacuum filter would be needed to dewater the same amount of sludge as the larger concentrator model. The vacuum filter does use less polymer moterial, but this is offset in the concentrator by lower energy requirements. Operating costs are lower with gravity-pressure filtration. Two treat-ment plants operated at different flows were used ment plants operated at different flows were used for sludge evaluation. In one, a secondary treatment facility, effluent could be discharged or diverted to tertiary treatment with combined flashmixing, flocculation, clarification and thickening of chemically treated waste. Raw sewage was used in this facility. Secondary effluent was used instead of raw sewage in the same scheme for the stead of raw sewage in the same scheme for the second facility. Settling was aided by the addition of anionic polymers. Sludge from biological treat-ment was evaluated for its dewaterability. In both facilities, effluent quality met acceptable levels for the processes employed. (Collins-FIRL) W77-08528

ENZYMATIC TREATMENT OF PRIMARY MU-NICIPAL SLUDGE WITH TRICHODERMA VIRIDE CELLULASE, State Univ. of New York at Buffalo. Dept. of

State Univ. of New York & Database Chemical Engineering. G. V. Cinq-Mars, and J. Howell. Biotechnology and Bioengineering, Vol. 19, No. 3, p 377-385, March, 1977. 3 fig, 3 tab, 9 ref.

Descriptors: *Sludge treatment, *Biological treat-Descriptors: "Studge treatment, "Biological treatment, Physical properties, Chemical properties, Municipal wastes, "Waste water treatment, Hydrolysis, Sludge digestion, Chemical degradation, Enzymes.

Identifiers: "Trichoderma viride, "Enzymatic

Experiments were conducted to determine the feasibility of sludge pretreatment before digestion with cellulase in order to reduce cellulose content and viscosity. Pretreatment was either by steriliza-tion at 120 C for 30 minutes, followed by adding 100 ppm merthiolate and homogenizing for 2 minutes, or by heat pasteurization to 95 C and cooling to 50 C. Hydrolytic experiments produced

Group 5D—Waste Treatment Processes

the following results. Up to 75% of the cellulose the following results. Up to 75% of the cellulose was converted, mostly to cellobiose, in 24 hours. Raw primary sludge was changed from a gel-like consistency to a slurry of fine particles amenable to ultrafiltration. Possible rate limiting steps in the conversion of cellulose to methane by anaerobic digestion could be reduced by converting cellulase to soluble reducing sugars before digestion; by the converting cellulase to soluble reducing sugars before digestion; by to soluble reducing sugars before digestion; by making reducing sugars available to allow an increased generation of microbial populations; and by a faster transfer of dissolved products from liquid to gas phase. An economical, self-supporting treatment system might be possible with the use of process filtrate for cellulase, single-cell protein, or alcohol production. (Collins-FIRL)

AEROBIC DIGESTION OF SLUDGES PRECIPITATED FROM WASTE WATER BY LIME ADDITION,

Toronto Univ. (Ontario). Dept. of Civil Engineer-

M. F. Hamoda, and J. Ganczarczyk.

Journal Water Pollution Control Federation, Vol. 49, No. 3, p 375-387, March, 1977. 4 fig, 7 tab, 12

*Aerobic Descriptors: treatment, digestion, *Lime, Physical properties, Chemical properties, Treatment facilities, Biological treatment, Evaluation, *Waste water treatment, Chemical precipitation.

Identifiers: *Aerobic digestion, Chemical treat-Laboratory batch and semi-continuous aerobic

digestion experiments were performed to examine the behavior of lime-primary sludges precipitated with various lime do:ages over an operational pH range. Sludge samples were obtained from a Toronto treatment plant. Results indicated that aerobic digestion of lime-primary sludges was technically feasible, though high lime doses adversely affected digestion process kinetics. The buf-fering capacity of the digestion system was good. Total alkalinity of the lime-primary sludge did not decrease because of aerobic digestion. However, the primary sludge decreased in alkalinity as aera-tion time increased. Nitrification was adversely aftion time increased. Nitrification was adversely affected in digesters treating lime-primary sludges when lime doses were high. Primary sludges as well as lime-primary sludges bound soluble phosphorus and soluble organic carbon during digestion and released these components during storage. Settling and filtration qualities of the aerobically digested lime-primary sludges were good. Semi-continuous digesters produced sludges with higher oxygen uptake rates, better dewaterability, and higher supernatant quality than those of batch systems. The pollutant content of sludges from semi-continuous systems should not cause serious loading problems if the supernatants are recycled or discharged by treatment plants. A sizable population of stalked ciliates and rotifers was mainin digesters treating lime-primary sludges Stabilization of lime-primary sludges requires a 15-day detention period at 20 C, especially if they have initial pH values of 10-12. (Collins-FIRL)

PHYSICOCHEMICAL TREATMENT OF AN AUSTRALIAN MUNICIPAL WASTE WATER, Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of

Ghemical Technology.
3. Y. Ip, L. O. Kolarik, N. H. Pilkington, W. G. C. Raper, and E. A. Swinton.

W77-08530

Water Research, Vol. 11, No. 2, p 173-180, 1977. 9 fig. 5 tab. 4 ref.

Descriptors: *Australia, *Pilot plants, *Ion exchange, *Resins, Coagulation, Sedimentation, Ammonia, Lime, Infiltration, Activated carbon, Filtration, Water purification, *Waste water treatment, *Treatment facilities, Desalination, Desalination, Hydrogen ion concentration.

Identifiers: Physicochemical treatment.

A pilot study was conducted to investigate physicochemical treatment (PCT) of waste water; to investigate integration of the 'Sirotherm' partial desalination process; and to test laboratory studies on applying magnetic ion-exchange resins to water purification. The plant uses lime coagulation at pH 11.5 with solids removal by flotation or sedimentation; ammonia stripping; neutralization to pH 10 by carbon dioxide; coagulation of precipitated calcium carbonate by ferric salts; clarification and sand-filtration; surfactant removal by foaming; water neutralization to pH 7; and granular activated carbon treatment. The plant produced a high-quality water from a constant flow of primary settled waste water. Operation was simple and practical. Lime scum flotation was effective with normal flows, but not when the flow was diluted with wet weather infiltration. Sedimentation was considered more reliable. Winter conditions did not substantially affect ammonia stripping, but packing scaling occurred. Granular carbon treatment was effective. Raw sewage treatment was not attempted; nor was operation in a total disposal mode or testing with varying flow rates. A buffer capacity between lime treatment and other stages was suggested. (Collins-FIRL) W77-08531

BIOLOGICAL TREATMENT KINETICS OF LANDFILL LEACHATE, Texas Univ. at Arlington. Dept. of Civil Engineer-

T. Palit, and S. R. Qasim. Journal of the Environmental Engineering Division-ASCE, Vol 103, No EE2, p 353-366, April, 1977. 8 fig, 4 tab, 3 append.

Descriptors: *Leachate, *Landfills, *Kinetics, Activated *Biological treatment, Nutrients, Sewage treatment, Phosphorus, Sewers, Treatment facilities, *Waste water treat-

Results are presented of biological treatment studies with landfill leachate. Biological kinetic coef-ficients were determined for landfill leachate with mean cell residence time as the only variable. Comparisons were made with those of the sanitary sewage. Results indicated that landfill leachate could be treated in an activated sludge plant. Sludge bulking occurred several times during experimentation and could be a serious problem. Additional nutrients may be necessaary to enhance plant performance since leachate contained low concentrations of prime nutrients. Combined leachate and sewage treatment may be beneficial, but further research is needed to determine the optimum mixing ratio. Conventional activated sludge with added phosphorus is an adequate treatment in areas where domestic sewers are not available. (Collins-FIRL) W77-08532

PROGRESS IN MHI'S INTEGRATED TECHNIQUES FOR ENVIRONMENTAL PRO-

Mitsubishi Heavy-Industries Ltd., Tokyo (Japan). Environmental Technology Dept. K. Matsumoto.

Technical Review, Vol 13, No 3, Ser. 37, p 173-191, October, 1976. 15 fig, 9 tab.

Descriptors: *Water pollution sources, *Air pollution sources, *Pollution abatement, *Environmental control, Treatment facilities, abatement. tion Water reuse, Sludge treatment, Sludge disposal, Organic matter, Drying, Incineration, Oil wastes, Biological treatment, Denitrification, Filtration, Solid wastes, Liquid wastes, Analytical techniques, Water quality control, Gases, *Waste

Results of recent advancements in water and air pollution control technology developed by Mit-subishi Heavy Industries, Limited, are presented. Water pollution control developments included

treatment techniques for potable water, industrial water, sewage, night soil, and industrial wastes. Sludge concentrating devices, vacuum filter, centrifugal, and filter press dehydrators, and incinera tors were discussed and described, as well as various water reuse schemes. New techniques have been developed to forecast effluent dispersion for preventing water pollution. Denitrification and trickling filter development were discussed with advances in solid wastes treatment. In addition, air pollution control, detection, and abatement were reviewed. (Collins-FIRL) W77-08533

THE SANITARY LANDFILL LEACHATE CON-TROL PLANT IN KOBE. Technical Review, Vol 13, No 3, Ser. 37, p 273-274, October, 1976. 2 fig, 1 tab.

Descriptors: *Leachate, *Landfills, *Treatment facilities, *Waste water treatment, Water quality control, Soil contamination, Design criteria, Sanitary engineering, Biological treatment, Chemical Identifiers: *Kobe(Japan).

A leachate control plant was constructed in Kobe, Japan, to treat leachate containing high amounts of BOD, COD, suspended solids, ammonia, and colored matter. The plant employs a storage dam to create a uniform quality and quantity of leachate for treatment; trickling filter towers for organic matter removal and ammonia nitrogen oxidation; sedimentation and flocculation-sedimentation facilities; denitrification columns; activated carbon adsorption columns; and dewatering processes. Special design considerations include a trickling filter process to avoid difficulties in the biological treatment of long-term landfill leachate, a biological filter process for denitrification which has few operational problems and low maintenance needs, and combined biological and physieconomical operation at optimum conditions. (Collins-FIRL) cal-chemical treatment to adjust water quality for W77-08534

CHARACTERIZING SLUDGE FOR CENTRIFU-GAL DEWATERING,

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Duke Univ., Durham, N. C. Dept. of Civil Engineering.

P. A. Vesilind.

Filtration and Separation, Vol 14, No 2, p 115-116, 118, 120, March/April, 1977. 5 fig, 3 ref.

Descriptors: *Dewatering, *Centrifugation, *Sludge treatment, Solid wastes, Equipment, Physical properties, Chemical properties, Waste treatment, *Waste water treatment, Design

The design of sludge dewatering equipment must depend upon characteristics of the sludge to be treated. Sludge characteristics were described which would enable engineers to specify conditions for the guaranteed performance of their equipment. A procedure was outlined for the measurement of settling properties under high cen-trifugal forces. Batch settling tests could be per-formed at high gravitational forces using a desk top centrifuge and a strobe light. Sludge-filled tubes are spun horizontally and the strobe is synchronized with the centrifuge so the height of the slurry-liquid interface can be observed. Settling of the uppermost particle in the slurry can be followed and its velocity calculated. This velocity measurement has the disadvantage of being dependent upon the force imposed, which can be eliminated by using a 'settling coefficient' con-cept. Other characteristics which indicate the ability of the sludge to be centrifuged include the clarity of the centrate and the ability of the sludge to be moved by the screw conveyor. (Collins-FIRL) W77-08535

OZONE AND CHLORINE IN WASTE WATER DISINFECTION, Okayama Univ. (Japan). Dept. of Civil Engineer-

Memoirs of the School of Engineering, Okayama University, Vol 11, No 2, p 37-49, January, 1977. 20 fig, 3 tab, 4 ref.

Descriptors: *Disinfection, *Chlorine, *Ozone, Oxidation, Aerobic bacteria, Toxicity, Suspended solids, Sewage effluents, *Chlorination, Biodegradation, *Waste water treatment.

The disinfection efficiency, oxidation power, and effects of ozone- or chlorine-treated secondary effluents on aerobic microorganisms were compared in ozone and chlorine waste water treatment. Disinfection of coliforms required a smaller dosage of chlorine than ozone, but chlorine could not sterilcanorine than ozone, our canorine count not sternize them as completely, even at high doses, or as quickly, as ozone. Ozone should be used where both disinfection and organic compound removal are desired. Suspended solids are well-decomare desired. Suspended solids are well-decomposed, as are the higher molecular compounds. Chlorine has little effect on these substances. Certain compounds which are conducive to aerobic bacterial growth are easily decomposed by ozone, but not by chlorine. Microbial growth rates were lowest in the control, and increasingly greater in ozone-treated effluents, chlorine-treated effluents, and secondary effluents. Ozonation increased biodegradability and chlorination decreased it. It was concluded that chlorination is neffective process when effluents do not contain an effective process when effluents do not contain high amounts of suspended solids and their removal is not the major desired result. (Collins-W77-08536

UNSTRATIFIED-RED FILTRATION OF WASTE

Iowa Natural Resources Council, Des Moines.

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No. F. Dehab, and J. C. Young.

Journal of the Environmental Engineering Division-ASCE, Vol. 103, No. EE1, p 21-36, February,

1977. 11 fig, 4 tab, 2 append. EPA Project 17030

Descriptors: *Filters, *Suspended solids, *Performance, *Filtration, Air, Flocculation, Design, Water purification, Analysis, Physical properties, Separation techniques, *Waste water treatment.

Identifiers: *Unstratified-bed filtration, Backwash

An investigation was conducted to determine the suspended solids removal and backwash characteristics of single-medium unstratified-bed filters and to determine the effect of media grain size and type on performance and backwash characteristics. Comparisons were made with dual-media filters. It was found that the unstratified-bed filters with the same effective size medium used as in the top layer of dual-media filters would provide the same effluent quality and run length as the dual-media filters. Use of these filters with combined media filters. Use of these filters with combined air-water wash allows a larger filter medium size than that of dual or multimedia filters. In-depth filtration is improved with larger sized filter mediums, and solids capture capacity is increased, as is the run length. Suspended solids removal is not significantly reduced by increasing media size from 1 millimeter to 2 millimeters at filtration rates of 5.10 meters/how: of 5-10 meters/hour. Filter bed depths above 914 millimeters produce no effective increase in effuent quality with filter mediums of an effective size of 1.3-1.5 millimeters. Backwash rates for effective cleaning of these filters are less than what is needed to fluidize the medium. Solids removal from the filter during backwash using air and water required nearly 4 cubic meters of water per square meter of filter area for backwash rates of 18.75-37.5 meters/hour. Combined air and water treatment during backwash improved the washout of large flocculated solids from the space above

the filter bed, and eliminated mudball formation. Media loss during this last operation is significant unless appropriate design and operating control measures are used. (Collins-FIRL.) W77-08537

CHLOROBIPHENYLS AND PCB'S: FORMA-TION DURING CHLORINATION, Georgia State Univ., Atlanta. Dept. of Biology. For primary bibliographic entry see Field 5A.

IMPROVED GALVANIC DISSOLVED OXYGEN SENSOR FOR ACTIVATED SLUDGE, Fischer and Porter Co., Warminster, Pa. For primary bibliographic entry see Field 5A. W77-08539

EFFECTS OF HIGH ORGANIC LOADING ON MIXED PHOTOSYNTHETIC WASTE WATER TREATMENT,

Cape Town Univ. (South Africa). Dept. of Chemical Engineering.
S. Miller, A. Abeliovich, and G. Belfort.

Journal Water Pollution Control Federation, Vol. 49, No. 3, p 436-440, March, 1977. 2 fig, 4 tab, 14

Descriptors: *Organic loading, *Organic matter, Loads(Forces), *Photosynthesis, Dissolved ox-ygen, Bacteria, Temperature, Hydrogen ion conygen, Bacteria, Temperature, Hydrogen Ion con-centration, Detergents, Biodegradation, Municipal wastes, Hospitals, Algae, Oxidation lagoons, Aerobic conditions, Biochemical oxygen demand, Carbon, Suspended solids, Nitrogen, Water purifi-cation, *Waste water treatment. Identifiers: Hospital wastes.

Hospital and domestic sludge was studied to determine the effect of high organic loading on mixed photosynthetic waste water treatment. The major inhibitors in hospital effluents on algal growth in treatment ponds are most likely to be detergents, solvents, and antibiotics. Tests were run to establish whether the greater carbon supplies and lower pH variation resulting from using sludge outweighed the disadvantage of decreased light penetration. Temperature, pH, dissolved oxygen, penetration. Temperature, pH, dissolved oxygen, photosynthesis, and respiration rates were recorded daily. Results showed the more alkaline hospital sludge to have a lower buffering capacity than domestic sludge. Little pH variation was found in the mixed photosynthetic system. There was evidence that appreciable algae growth was possible with hospital effluents after the bacteria had adapted to environmental conditions. Respiration rates decreased continuously in reactors with sludge added. Dissolved oxygen proved a good in-dicator of the state of the system. Oxygen levels dicator of the state of the system. Oxygen levels were high at high pH where carbon limitation might be evident. Sludge biodegradation, usually anaerobic, results in significant carbon losses in the form of CH4 and CO2. The tests showed that a greater algal yield without impairment of water quality can be expected in photosynthetic system with high organic loading. (Collins-FIRL) W77-08540

WHAT LIES AHEAD FOR PAC,

Culp, Water and Wastes Engineering, Vol. 14, No. 2, p

67-72, 74, February, 1977.

Descriptors: *Activated carbon, Costs, *Cost comparisons, Municipal wastes, *Waste water treatment, Polymers, Dewatering, Organic matter, Hydrogen sulfide, Activated sludge, Physical properties, Chemical properties. Identifiers: Granular activated carbon, *Powdered

activated carbon.

The development and use of powdered activated carbon were discussed. Granular activated carbon

has found wider use because efficient regeneration systems for powdered activated carbon are lacking. Several advantages of the powdered carbon are: a significantly lower price; more rapid equilibration with soluble waste water organics; less capital investment; easily changed dosages; less head loss; and easy avoidance of hydrogen sulfide formation problems. Cost estimates of various treatment systems indicated that independent physical-chemical (IPC) systems, with either granular or powdered carbon, were not cost competitive with conventional activated sludge for BOD removal in municipal use when only secondary treatment was necessary. Granular carbon IPC systems were cost comparable to activated sludge followed by coagulation and filtration at carbon doses of 1500 pounds/million gallons. It was slightly less expensive at doses of 750 pounds/million gallons. Powdered carbon was not cost competitive with granular carbon. It has higher capital and labor costs, higher fuel requirements, and requires polymer conditioning for dewatering. Determining the minimum carbon dosages compatible with single clarifier-combined sludge handling systems would yield economically favorable results. (Collins-FIRL) W77-08541

CONSTRUCTION AND MAINTENANCE COSTS OF SEWER SYSTEMS (BAU- UND BETRIEB-SKOSTEN VON KANALISATIONSANLAGEN), For primary bibliographic entry see Field 8A. W77-08542

APPLICATION OF CORRUGATED SHEET SPRAYERS FOR WATER PURIFICATION (DIE ANWENDUNG VON WELLBAHNRIESLERN IN DER WASSERAUFBEREITUNG), For primary bibliographic entry see Field 5F. W77-08543

DEWATERING MACHINES (ENTWASSERUNGSMACHINEN), K. C. Shin.

Wasser, Luft und Betrieb, Vol 21, No 3, p 137-141, 1977. 8 fig, 3 tab, 3 ref.

Descriptors: *Dewatering, *Equipment, *Sludge treatment, Filters, Centrifugation, Filtration, Separation, Treatment facilities, Performance, *Waste water treatment.

The principal types of waste water sludge dewatering equipment used currently and their general characteristics are described. Centrifuges, belt filcharacteristics are described. Centrifuges, belt filters, and chamber filter presses represent the most common means for dewatering sludge. Centrifuges can be used for any size waste water treatment plant because they are available for a wide range of throughput capacities. Chamber filter presses, which have separating efficiencies, are especially suitable for use in large-capacity waste water treatment facilities. Belt filters are used for treatment plants of small to medium capacity. S type filter belt presses can reach separation efficiencies as high as 99%. (Takacs-FIRL)

USE OF OXYGEN IN ACTIVATED SLUDGE PLANTS (UTILIZZAZIONE DELL'OSSIGENO ALLO STATO PURO NEGLI IMPIANTI A FANGHI ATTIVI), Florence Univ. (Italy). Facolta di Ingegneria.

L. Masotti.

Inquinamento, Vol 19, No 1, p 64-72, January, 1977. 6 fig, 1 tab, 16 ref.

Descriptors: *Oxygenation, *Activated sludge, *Adsorption, *Cryogenics, Dissolved oxygen, Treatment facilities, Temperature, Aeration, Nitrogen, Air, Automation, Maintenance, Water purification, *Waste water treatment. Identifiers: Pure oxygen activated sludge treat-ment, Liquid oxygen.

Group 5D—Waste Treatment Processes

Pure oxygen activated sludge treatment processes are replacing aerated systems because of the latter's weaknesses in transferring oxygen from the atmosphere to the liquid medium. In a pure oxygen system, the oxygen is infused in concentrated form into the liquid. As a result, the quantity of transferred oxygen is 6.4 times greater than in aerated system. Large quantities of dissolved oxygen (6-8 mg/liter) can be present in the activated sludge without significantly affecting the oxygen transfer yield; in an aerated system, the maximum quantity of dissolved oxygen is 2-3 mg/liter. A pure oxygen system can achieve a 90-95% utilization of the dissolved oxygen compared to 5-6% in an aerated system. The success of a pure oxygen activated sludge system is based on its capacity to Pure oxygen activated sludge treatment processes activated sludge system is based on its capacity to produce oxygen. There are two oxygen production processes, the classic cryogenic process and the molecular sieve adsorption process. The former uses the distilled fraction of air, thus producing liquid oxygen and nitrogen at very low temperatures. While the yield of almost pure oxygen is excellent, the process is complex and only used in large purification plants. The molecular sieve adsorption process is simple, completely automatic, and requires minimal maintenance. Air is pressurized through a sieve containing a granular substance which adsorbs carbon dioxide, nitrogen and water, and lets the residual gas, very rich in oxygen (90%), pass through. The process operates at room temperature and at a fairly low pressure. (Waltner-FIRL) W77-08545

DETERMINATION OF BOD AFTER FREEZING WATER SAMPLES (BESTIMMUNG DES BSB NACH EINFRIERUNG DER WASSERPROBEN), For primary bibliographic entry see Field 5A.

AN ESTIMATION OF THE EFFICIENCY OF A AN ESTIMATION OF THE EFFICIENCY OF A
WASTE WATER TREATMENT PLANT, AS
MEASURED BY SEVERAL PARAMETERS INCLUDING LIPID BIODEGRADATION (ESSAI
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STATION D'EPURATION A L'AIDE DE
PLUSIEURS PARAMETRES DONT LA STATION D'EPURATION A L'AIDE PLUSIEURS PARAMETRES DONT BIODEGRADATION DES LIPIDES), Lyon Univ. (France). Toxicology Lab.

P. Chambon, M. Pierson, E. Pattee, J. Vial, and R. Chambon-Mougenot.
La Tribune du Cebedeau, Vol 30, No 398, p 2-7,

January, 1977. 2 fig, 2 tab, 7 ref.

Descriptors: *Treatment facilities, *Evaluation, Performance, *Biological treatment, *Lipids, Analysis, Biochemical oxygen demand, Chemical oxygen demand, Detergents, Biodegradation, *Waste water treatment.

Lipids, BOD, COD, detergents, and CH2 content in inflow and outflow were used to estimate the waste water treatment efficiency of a biological discs system. C12 and C18 were dominant compounds revealed by the analysis of the lipidic fraction. These compounds were eliminated to a con-siderable extent. It was found that the biodegradasucrable extent. It was found that the biodegrada-bility of a chemical class is best appreciated when specific parameters are chosen. The time of sam-pling is more important at the inflow than at the outflow of a plant because mean values are always recorded at the outflow. (Collins-FIRL) W77-08548

POLYETHYLENE SEWER FORCE MAIN TAKES VARYING PRESSURES. For primary bibliographic entry see Field 8G. W77-08549

SEWAGE PUMPING STATION BUILT TO HAN-DLE FUTURE SYSTEM DEMANDS, Topeka Water Pollution Control Dept. Kans. For primary bibliographic entry see Field 8C. W77-08550

THE PROTECTION AND REPAIR OF UNDERGROUND PIPELINES FOR WATER AND

For primary bibliographic entry see Field 8G. W77-08551

POST-TENSIONED SEWER RIVER CROSSING. For primary bibliographic entry see Field 8E. W77-08552

PLAIN-END PIPE 'COLLARS' PROBLEM SEWER CONNECTIONS, For primary bibliographic entry see Field 8G. W77-08553

IDEAS APLENTY-BUT STILL SEWERS FACE CASH NEGLECT. For primary bibliographic entry see Field 8G. W77-08554

SEABED SEWERS FOR HONG KONG, Watson (J. D. and D. M.) (Hong Kong). For primary bibliographic entry see Field 5E. W77-08555

CONCRETE BUCKET DISTRIBUTES CRUSHED BEDDING EVENLY ON SEWER For primary bibliographic entry see Field 8F.

AEROBIC TREATMENT OF LIQUID WASTES-WITH OXYGEN CONCENTRATION MEASURED AND USED TO CONTROL PUMP SPEED USED TO FORCE LIQUID THROUGH

Netherlands Patent NL 7608-692. Issued February 8, 1977. Derwent Netherlands Patents Abstracts, Vol. Y. No. 8, p D7, April 1, 1977.

*Patents, *Aerobic treatment, Descriptors: *Oxygen, *Pumps, Liquid wastes, Reservoirs, Dissolved oxygen, Sewage effluents, Sedimenta-tion, Equipment, Industrial wastes, Performance, *Waste water treatment.

A patent was issued for an aerobic treatment process for liquid wastes. The waste flows through a reservoir and a portion is removed and reinjected, with added air, into the reservoir. This creates a horizontal aerated liquid flow. A device, sensitive to the liquid oxygen concentration, controls the speed of the pump which forces the liquid through the ejectors to maintain a determined dissolved oxygen level. Liquid from the reservoir flows out and up through tube settlers above the liows out and up through tube settlers above the level of the ejectors. The process may be applied to sanitary and industrial waste liquids. Power needs are lowered and a maximum efficiency is obtained. (Collins-FIRL)

MECHANICAL SURFACE AERATOR FOR EF-FLUENT PURIFICATION--HAS THE LIQUID SCOOPED BY THE CURVED ELEMENTS AND EJECTED INTO THE AIR ABOVE,

P. N. Chumachenko, G. I. Papkov, and V. F.

Soviet Patent SU 508-485. Issued August 6, 1976. Soviet Inventions Illustrated, Vol. Y, No. 9, p D3-D4, April 12, 1977. 1 fig.

Descriptors: *Patents, *Aeration, *Equipment, Water purification, Performance, Domestic wastes, Industrial wastes, Oxygen, Liquid wastes, *Waste water treatment.

A patent was issued for an aerator to be used in the biochemical purification of water. The device consists of a vertical shaft with curved elements mounted at angles to each other, and a mechanical

drive. Inlets and outlets are placed about the rota-tional direction of the shaft. Rotation of the eletional direction of the shart. Rotation of the eigenents occurs as the liquid passes through. The liquid is then ejected into the air above the liquid level for aeration. This saturates the liquid with oxygen; additional mixing and aeration take place on the side plane of the curved element. Aeration effectiveness is very independent of level varia-tions in the aeration tank. (Collins-FIRL) W77-08558

BREAKING DOWN SOLID AND LIQUID WASTE TO FORM A FERTILIZER--BY INOCULATION WITH SELECTED FUNGI AND FER-MENTATION.

For primary bibliographic entry see Field 5E. W77-08559

SLUDGE COLLECTOR AND LIGHT LIQUID, SEPARATOR-FROM SEWAGE WITH TWO TANKS IN SINGLE HOUSING AND COVER. French Patent FR 2309-677. Issued December 31, 1976. Derwent French Patents Abstracts, Vol Y, No 9, p D9, April, 1977.

Descriptors: *Patents, *Sludge treatment, *Liquid wastes, *Equipment, Oil wastes, Pumps, Sewage effluents, Water reuse, *Separation techniques, *Waste water treatment.

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A patent was issued for a process to collect sludge and to separate settled materials from light liquids. The apparatus is installed in a common covered housing. Contaminated water enters the inlet and settled material is placed in the collector as the liquid moves over the overflow and under a partition into the separator. Light materials float upwards and water passes under the partition. A pump evacuates buildups of separated matter. Light liquids are removed through one pipe and sludge through another. Water is recycled for jet injection to break up the floating light materials; the collector and separator are washed by water. Separated materials can be removed by a pump as eded. (Collins-FIRL) W77-08560

CLEANING OF SEWAGE SLUDGE SYSTEM. Australian Patent 480,414. Issued February 17, 1977. Australian Official Journal of Patents, Trade Marks, and Designs, Vol 47, No 5, p 387, February 17, 1975.

Descriptors: *Patents, *Sludge treatment, *Cleaning, Pumps, Piping, Separation, Oxidation, Heat exchangers, *Waste water treatment, Equipment, *Sewage sludge.

A patent was issued for a sludge system cleaning process. The process involves a high pressure pump connected to a sludge source, and piping from the pump to a heat exchanger, a reactor, a separator, and an oxidized sludge tank. A cold water source separated from the sludge source has a separate pipe leading to the pump. The sludge line to the pump is closed and the cold water line is opened. The cold water is directed through the heat exchanger, by-passing the reactor, to isolate heat exchanger, by-passing the reactor, to isolate neat exchanger, oy-passing the reactor, to isolate the hot reactor contents from the system. Afterwards, the cold water line is closed, the sludge line is opened, and the reactor is returned to the system. Sludge blockage is removed by cold water system. Shudge blockage is removed by cold water flowing through the heat exchanger in the reverse direction of sludge flow during normal operation. The blocking material is flushed through a previ-ously closed drain line. (Collins-FIRL) W77-08561

SCREENING APPARATUS FOR REMOVAL OF SOLIDS--FROM SEWAGE WITH ROTATING SCREEN AND VERTICAL LIFT FOR RESIDUES.

French Patent FR 2308-599. Issued December 24, 1976. Derwent French Patents Abstracts, Vol Y, No 8, p D5, April, 1977. Descriptors: *Patents, *Separation techniques, *Solid wastes, *Filtration, Equipment, Sewage effluents, Mechanical engineering, Sewage treatment, *Waste water treatment, Waste treatment.

A patent was issued for a screening apparatus to remove solids from sewage. Sewage flows through a cylindrical screen with a vertical axis and solids are retained on the external face, separating them from the flow. The screen is either fixed or rotated by motor. A second screen, of vertical rods, is located to the side of the first one. The rods extend above the level of flow and a hydraulic ram moves a lifting plate up and down. This plate collects solids which remained on the second screen and pushes them into a compression chamber. The first screen has scraper and the process is continuous. (Collins-FIRL)

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BOC BLOWS BUBBLES IN DIRTY BATH WATER,

WALEK, B. Appleton. New Civil Engineer, No 229, p 19, February, 1977.

Descriptors: *Sewers, *Oxygen, *Sewage effluents, *Biological treatment, Biochemical oxygen demand, Capital costs, Oxygenation, Sedimentation, Suspended solids, Temperature, Floculation, Performance, Filters, *Waste water treatment, Injection.
Identifiers: Effluent quality control.

Identifiers: Effluent quality control.

The British Oxygen Company (BOC) and the Wessex Water Authority have developed an oxygen injection system for sewers which improves final effluent quality by 30-60%. Previously used for hydrogen sulfide control, oxygen injection in this application can reduce capital expenditures. Microbial activity is induced in the final sewer section to reduce BOD of raw sewage. Biological treatment is enhanced as is the settleability of the oxygenated sewage. An injection rate of 45 kilograms/hour produced a small residual dissolved oxygen concentration at the delivery end of the main and improved the final effluent to 21 milligrams/liter of BOD. Flocculation is improved, and filter performance is greatly enhanced by the reduced biological loading. Pump efficiencies, however, were decreased by an average of 8% because of a delay in reaching steady-state conditions. Performance was reduced in winter due to the temperature-sensitive biological activity in the sewers, but it was within the effluent ranges required. (Collins-FIRL)

MICHIGAN TREATMENT PLANT ACHIEVES ZERO DISCHARGE, IRRIGATES CROPLAND, Water and Sewage Works, Vol. 124, No. 3, p 42-44, March, 1977. 2 tab.

Descriptors: *Tertiary treatment, *Treatment facilities, Domestic wastes, Industrial wastes, Oxidation lagoons, Irrigation, Lakes, Organic matter, Nutrients, Flow, Crops, Growth rates, Soil types, Biochemical oxygen demand, Maintenance, Costs, *Waste water treatment.

Identifiers: Paw Paw(MI), Zero discharge.

Paw Paw, Michigan, has built a sewage treatment plant which has met the EPA goal of zero discharge by 1985. The community treats domestic and industrial wastes in facultative lagoons, then retains it in an artificial lake up to six months. The final wastes are applied as crop irrigation water. There is no bulk sludge to handle since almost all organic substances are naturally reduced. Revenue estimates for the irrigation program have been as high as \$450 per acre. The water is rich in nitrogen, phosphorus, and other nutrients. Sanitary sewers are tightly sealed from community storm sewers. Domestic flow averages 0.39 mgd and industrial flow averages 0.16 mgd. This system has provided 95-98% BOD removals and 80-89% suspended

solids removals. System design is for a discharge of 2-3 inches per week for the entire treatment area, but flows are to be changed in consideration of soil types, natural rainfall, and the growth stage of each crop. The system was designed to absorb shocks and has treated BOD loadings of 7500 pounds without trouble. It was designed to handle a 4000 pound BOD loading. The system quickly dispels odor problems. Maintenance requirements and operational costs are reasonably low. (Collins-FIRL) W77-08565

HIGH CAPACITY WASTE WATER TREAT-MENT SYSTEM,

Mixing Equipment Co., Inc., Rochester, N. Y.
Paper Trade Journal, Vol. 161, No. 2, p 46, March, 1977. 1 fig.

Descriptors: *Waste treatment, *Activated sludge, Equipment, *Aeration, Biochemical oxygen de-mand, Suspended solids, Nitrification, mand, Suspended solids, Nitrification, Phosphorus, Chemical treatment, Concrete con-struction, *Waste water treatment. Identifiers: *Lightnin treatment system.

The Lightnin high capacity treatment system was introduced in the United States from Canada. For activated sludge applications, a mechanical aerator, surface or submerged, produces a flow to recycle settled sludge from an integral clarifier. The process handles flows from thousands to millions of gallons per day, and easily handles biologi-cal shock loads. It features common wall concrete construction and satisfied BOD and solids regulations for secondary treatment at wide BOD loadtions for secondary treatment at wide BOD loading ranges and concentrations up to 3,000 milligrams/liter. The process can operate at MLSS concentrations of 2,000-12,000 milligrams/liter or higher. Phosphorus is removed by adding chemicals directly to the aeration basin and nitrification is easily achieved. There are minimum sludge handling costs, no submerged diffusers have to be cleaned, and there are no underwater bearings on the clarifier mechanism. (Collins-FIRL)

AERATORS CONTROL LIFT STATION ODOR

AND CORROLL LIFT STATION O AND CORROSION, Mullins (W. H.), Inc., San Antonio, Tex. For primary bibliographic entry see Field 5G. W77-08567

SUSPENDED SOLIDS MEASUREMENT GIVES IMPROVED CONTROL, Instruments (H. F.) Ltd., Bolton (Ontario).

For primary bibliographic entry see Field 5A. W77-08568

TRENDS IN SMALL SEWAGE TREATMENT PLANTS,

Treatment Plant Contracts Ltd., Hounslow (England).

(Chigana).
O. A. Goulden.
Effluent and Water Treatment Journal, Vol. 17,
No. 1, p 37-38, January, 1977.

Descriptors: *Treatment facilities, *Septic tanks, *Aeration, Tertiary treatment, Municipal wastes, Domestic wastes, Economics, *Waste water treat-ment, Filtration, Biological treatment, Legislation,

Costs. Identifiers: *Great Britain.

Developing trends in small sewage treatment plants were delineated for the British nation. Six trends are of major importance. These include a growing septic tank market, the requirement of many water authorities that filter beds be used as well, a rise in maintenance costs, the increase in sophisticated treatment systems, the failure of various 'high technology' aeration tanks to produce capital and operational cost savings, and new sewage rates introduced by the government.

These trends have become important because of the assumption that Britain would benefit from small privately owned plants in many ways. They are economical and produce multiple discharges of treated effluent into subsoils rather than a massive outfall from a major septic tank and filter bed and soakaway. Various economic considerations would require that treatment plants have a life of would require that treatment plants have a life of 30 years or more. This is not yet true of advanced treatment plants. A septic tank plus filter bed and soakaway for up to 15 people, and a biological filter bed for 15-1000 people fulfills this requirement. A full-time attendant and advanced technology are valid for installations for more than 1,000 people. This appears to be the best program until operational and maintenance costs for advanced treatment facilities can be achieved. (Collins-FIRL) W77-08559 W77_08560

S. W.'S SLUDGE INCINERATION SCHEME, For primary bibliographic entry see Field 5E. W77-08570

CHLORINE COMBINING WITH SEWAGE, Water and Waste Treatment, Vol. 20, No. 2, p 18, February, 1977.

Descriptors: "Chlorination, "Sewage treatment, Treatment facilities, Toxicity, Bacteria, Disinfec-tion, Industrial wastes, Pollution abatement, Monitoring, "Waste water treatment, Chemical reactions, Analysis, "Chlorine, "Polychlorinated biphenyls, Canada. Identifiers: *Chlorinated biphenyls.

The Ontario Ministry of the Environment is investigating the possibility that toxic substances are being created from the chemical reaction of industrial wastes and the chlorine used in sewage treatment. The formation of chlorinated biphenyls can be an especially serious problem. Laboratory tests have produced these substances in ways which might be similar to what occurs during sewage treatment, but there is no evidence of chlorinated biphenyl production under actual con-ditions. PCB levels in the area of 40 sewage treat-ment plants have been monitored for two years, because of their potential cumulative risks. The production of chloroform is another worry of those concerned about chlorine treatment. The production of such toxic or carcinogenic agents has been a theoretical drawback to the extremely beneficial use of chlorine for seage and drinking water. To avoid the possible dangers of using chlorine, ozone is being considered as an alterna-tive treatment method. (Collins-FIRL) W77-08571

EVERYTHING FROM A PIPE FILTER TO A TURNKEY PROJECT, Water and Waste Treatment, Vol. 20, No. 2, p 23-

24, February, 1977.

Descriptors: *Sewage treatment, *Treatment facilities, Tertiary treatment, Sanitary engineering, Reverse osmosis, Desalination, Water purification, Equipment, Filtration, Disinfection, *Waste water treatment.

Identifiers: Middle East.

The Sewage Treatment Division of Paterson Candy International, Limited, has undertaken the task of designing conventional and advanced treat-ment facilities and equipment for appliation in Middle Eastern nations. It has contracted many Middle Eastern nations. It has contracted many projects for water treatment to potable quality for use in boreholes, trailer and skid-mounted treatment facilities for the military, swimming pool purification plants, and pre-fabricated facilities for small residential/industrial applications. It has much experience with desalination by reverse osmosis, chemical water treatment, sewage treatment, and water sterilization. (Collins-FIRL) W77-08572

Group 5D—Waste Treatment Processes

KOWLOON SEWAGE TREATMENT AND DISPOSAL, Effluent and Water Treatment Journal, Vol. 17,

No. 2, p 94, February, 1977.

*Sewage treatment. disposal, Water pollution sources, Pollution abatement, Industrial wastes, Domestic wastes, Design, Treatment facilities, Piping, Separation, Equipment, Planning, Urban areas, Asia, Waste water treatment. Identifiers: *Hong Kong.

Various feasibility studies and investigations were conducted by the Hong Kong Government to develop treatment schemes as alternatives to ocean disposal of sewage and industrial wastes. A two-year study included float tracking and current measurement; determination of salinity and water temperature; and evaluation of the extent of pollution as expressed by dissolved oxygen levels and coliform bacteria counts. Sediment and bottom mud conditions were also studied. Design studies were conducted to develop treatment facilities in various areas of Hong Kong, Development will be carried out in two stages, at a cost of HK\$520 mil-lion. A facility for North West Kowloon was sug-gested with interception of sewage and industrial wastes and conveyance by underwater pipeline to a treatment works on reclaimed land. The treatment works will have a main pumping station, and facilities for grit removal and fine screening. Screening and degritted sewage will be discharged by a new outfall and diffuser to the main harbor current stream. Added stages will include another interceptor and sewage and sludge treatment. Construction will have to survive typhoons and be such that shipping activities and harbor traffic will not be interruped. This will probably be achieved by enclosing trunk sewers in immersed tubes. The completion of stage one is projected for 1980. (Collins-FIRL) W77-08573

SEWAGE WORKS IS ABOVE GROUND LEVEL, Water and Waste Treatment, Vol. 20, No. 2, p 13-14, February, 1977.

Descriptors: *Treatment facilities, *Sewage treatment, Costs, Flows, Industrial wastes, Water districts, Design, Piping, Corrosion control, Monitoring, Engineering structures, *Waste water treatment. Construction.

Normanton, Yorkshire, England, has replaced an inadequate treatmnet plant with one using the latest techniques. A regional facility, to handle increased industrial and housing development, is being constructed in two phases. The completed facility will be able to handle sewage for a population of 58,000, and would cost about 3.5 million pounds. Differences from other advanced systems include the pumping of all flows to the head of the works, and above ground treatment units. The sedimentation tank water level is about 3 meters above ground, allowing all associated pipe work to be placed in a covered gallery on the hipper end of the tank. This protects the pipes from the environment and provides workmen with a good work area. The piping is of ductile iron and flanged design. The versatility of this piping allowed the creation of a neat and endurable pipe system im-mune to accidental damage and extremely reistant to internal corrosion. Push-button operation of the de-sludging valves aid checking of sludge con-sistency through a sight glass. Sedimentation tank feed ports are designed to diffuse the flow an entry to establish early solids settling. These ports are made of glass-fiber reinforces plastic to ensure a long trouble-free life. (Collins-FIRLL) W77-08574

OXYGEN SYSTEM ACTIVATED SLUDGE

Effluent and Water Treatment Journal, Vol 17, No 2, p 83, February, 1977. 1 fig.

Descriptors: *Oxygenation, *Sludge treatment, Aeration, *Activated sludge, Aerobic conditions, Oxygen, Gases, Oxygen demand, Design, Suspended solids, Treatment facilities, *Waste water treatment, Tertiary treatment. Identifiers: *UNOX system.

Development of the UNOX activated sludge treatment process has eliminated many of the drawbacks of traditional activated sludge treatment. The negative aspects included the need for large aeration tanks and land areas, odor problems from open tanks, and rapid effluent quality declines at loadings greater than design. Most of the problems were traced to a shortage, or transient shortage of dissolved oxygen. The use of pure oxygen provides a healthier, more efficient process. The UNOX system uses about 90% of the oxygen gas fed into it. This gas and activated sludge and sewage are contacted in multi-stage reactors. A near four-fold efficiency increase resulted from the use of pure oxygen. On-site oxygen supply can be accomplished by a pressure swing adsorption oxygen generator. The process maintains a DO of 2-8 milligrams/liter, creating an optimum environ-ment for activated sludge. This allows the system to operate at high mixed liquor suspended solids concentrations with a more active biomass per unit volume. Because of this, retention times can be 25-50% less than in conventional plants. The system can easily respond to changes in load and can be adapted to existing activated sludge systems. Sludge production is less and can be treated for direct application to land. The plant requires less land than conventional systems and avoids most of the objectional features of them. (Collins-FIRL)

INCINERATION SOLVES TOUGH WASTE

For primary bibliographic entry see Field 5E. W77-08576

TRAVELLING GRATE-TYPE FILTRATION SYSTEM USES PULVERIZED COAL TO LOWER BOD OF WASTEWATER. Water and Pollution Control, Vol 115, No 3, p 38,

March, 1977.

Descriptors: *Filtration, *Biochemical oxygen demand, *Coal, Equipment, Organic matter, *Waste water treatment, *Filters, Suspended solids, Liquid wastes, Heavy metals.

A traveling grate-type filtration system was developed to lower BOD loads of organic pollutant waste water, using pulverized coal. BOD is waste water, using purverned coal. BOD is reduced to under 2 ppm and heavy metal ions are reduced by more than 90%. A revolving cylinder serves as the settling tank. Waste water and precipitation accelerators are introduced at the same time. Waste water passes from the bottom opening of the tank to a sump tank and then to the coal filter bed. After pollutant absorption, the coal is removed for disposal by a rake arm, along with suspended solids and other contaminants which settled out of the waste stream. Treated water is fed to a sprinkling filter bed for biochemical treatment to lower organic content. (Collins-FIRL)

PROSPECTS STRONG FOR WASTE WATER OXYGENATION. W. J. Storck.

Chemical and Engineering News, Vol 55, No 13, p 17-18, March, 1977.

Descriptors: *Oxygenation, *Waste water treatment, *Treatment facilities, *Aeration, Oxygen, Biochemical oxygen demand, Municipal wastes, Sludge, Costs, Equipment.

Oxygen aeration of waste water is becoming more attractive as waste water treatment is more strictly regulated. It can double treatment capabilities

without necessitating a vast expansion of facilities. In addition, it could provide greater BOD removal, sludge digestion, and nitrification. There is the promise of greater removal efficiencies with lower operating costs than air aeration, though capital operating costs than air aeration, though capital costs are greater. However, a section of P.L. 92-500 calls for 75% federal financing of eligible capital costs, and some state governments offer various subsidies. Oxygen aeration systems reduce air pollution in the form of odors and virus contaminants. Sludge disposal problems are reduced by the production of a denser, lowvolume sludge. Improvements in oxygen produc-tion and modular construction are also considered to be advantages of this system. (Collins-FIRL) W77-08578

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EFFLUENT EMPHASIS UNDERLINES EN-VIRONMENTAL EFFORT AT ENPOCON,

Environmental Protection Survey, p 11-13, February, 1977. 3 fig.

Descriptors: *Water purification, Liquid wastes, *Flotation, *Aeration, *Electrolysis, *Chlorination, *Flocculation, *Oxygenation, Oxygen, Pumps, Waste disposal, Equipment, In-cineration, Sludge disposal, Pollution abatement, Polymers, Chemical treatment, Gases, *Waste water treatment.

Various waste effluent treatment methods were demonstrated at an English exhibition. A packaged dissolved air flotation plant was shown which was fabricated of steel to eliminate the time, costs, and land usage required for concrete tanks or lagoons built on site. The effluent is pumped from a wet well to a holding tank, with air introduced up-stream from the pump. The air is in solution until it reaches the flotation cell in the coagulation chamber where it is released as tiny bubbles. The resultant float is removed by a scraper arm and placed into a sludge hopper. The effluent is removed and recycled. A system employing elec-trolytic treatment with flotation was claimed to reduce operating costs by as much as 50% when compared with air flotation. Chlorination units were also displayed. There was an 8,000 ppd liquid chlorine evaporator and a high capacity chlorina-tor, as well as one based on the use of solid tablets of a mixture of calcium hypochlorite and 1,3,4,6tetrachloroglycoluril. A pure oxygen waste water treatment system and a submersible aerator were other units shown. Solutions to disposal problems were seen in a thermal sludge drying system which produced a pelletized material, and in incineration unites. (Collins-FIRL)

SEWAGE SLUDGE DISINFECTED BY ELEC-TRON-BEAM BOMBARDMENT. Compost Science, Vol. 18, No. 1, p 24, January-

February, 1977.

Descriptors: *Sludge treatment, *Disinfection, *Irradiation, Heavy metals, Sludge disposal, Equipment, Bacteria, Viruses, Treatment facilities, *Waste wa Water treatment. *Waste water treatment, Sewage sludge,

An irradiation process was developed for the dis-infection of sludge. Greater restrictions on sludge disposal have spurred interest in this sludge treat-ment for the destruction of odor, bacteria, and viruses. Electron-beam bombardment is being tested by the Massachusetts Institute of Technology and the University of New Hampshire at a Der Island, Massachusetts, facility. Sludge water with 2-5% solids is treated in a 4 foot-wide, 2 millimeter-deep stream. This facility treats 100,000 gallons of sludge per day. A commercial facility equivalent to the test facility would require an initial investment of \$500,000 and an annual operating budget of nearly \$130,000. (Collins-FIRL) W77-08580

SLUDGE DEWATERING PRESS. For primary bibliographic entry see Field 5E. W77-08581

FLUID BED FOR SEWAGE SLUDGE BURN UP, For primary bibliographic entry see Field 5E. W77-08582

1.17 MILLION (POUND) WORKS AND SEWAGE SCHEME COMPLETED AT MARKET RASEN.

Surveyor, Vol. 149, No. 4423, p 32, March, 1977.

Descriptors: *Treatment facilities, *Sewage treatment, Construction, Pumps, Sedimentation, Fil-tration, Sludge treatment, Dewatering, Water reuse, *Waste water treatment, Sewers. Identifiers: Anglian Water Authority(England).

A treatment facility was constructed in England at a cost of 1.17 million pounds. The plant was con-structed to handle flows up to 130 liters/second daily. Excess flows are discharged to a river by screw pump. Flows pass through a grit trap, a comminutor, a flow recorder, and then are divided between two sedimentation tanks. The effluent is next divided at the dosing tanks and passed to filter beds where recirculation occurs. Modified al-ternating double filtration will be added later. After filtration, the effluent is discharged to humus tanks, and finally into a river. (Collins-FIRI.) W77-08584

AUTOMATIC CONTROL OF WHITLINGHAM SEWAGE TREATMENT WORKS NORWICH, B. L. Thurley.

Process Biochemistry, Vol. 12, No. 1, p 26, 28-29, January/February, 1977. 1 fig.

Descriptors: *Automatic controls. *Monitoring. *Treatment facilities, Sedimentation, Activated studge, Computers, Flow, Filtration, Sludge treat-ment, Sludge digestion, Sludge disposal, *Waste water treatment, *Sewage treatment. Identifiers: Norwich(England).

A digital computer was used to provide automatic control for a treatment facility consisting of existing facilities and 'in construction' extensions. The apparatus controls flow rate through the duty screen and operates a standby screen during Detritor scraper and grit rake operation; it also controls the flow to activated sludge and percolating filter plants, sequences the de-sludging process, and in-itiates the cleaning of flume float wells. A complete alarm-monitoring program is included in the computer controls. Ultrasonic sensors mea-sure solids content to determine sludge withdrawal during primary sedimentation. Minimum head loss is maintained during activated sludge treatment, as is a predetermined dissolved oxygen concentra-The computer also controls the amount of sludge wasting, and monitors and integrates the amount passed to waste. Computer control is used with the two filtration systems employed: single filtration/recirculation, and single filtra-tion/alternating double filtration. The sludge treatments involved are the automatic feed of sludge to primary digestion tanks, and displacement into secondary digestion tanks and filter pressing. Sludge W77-08585

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FILTERS AND SLUDGE DRYING BEDS, Water and Waste Treatment, Vol. 20, No. 2, p 35, 38, February, 1977.

Descriptors: *Filters, *Drying, *Sludge treatment, Clay pipes, Sewers, Hydrogen sulfide, Conduits, Temperature, Drainage, Chlorides, Design chleria, Construction materials, Equipment, *Waste water treatment. Identifiers: *Sludge drying beds.

Naylor Brothers, Limited, in England, has mar-Naylor Brothers, Limited, in England, has marketed sludge bed floor tiles in the Middle East. The tiles, used for drying sludge, facilitate drainage and help ventilation to aid drying of the under-side of the sludge cake. Cost savings in construction are another advantage because the tiles replace layers of graded media. Filter tiles also aid the drainage of effluent from biological filters and provide basal aeration. Vitrified clay piping is used in the area to reduce hydrogen sulfide formation which can result from high temperatures, and low sewage dilution in sewers, and from flat gradients. These products are resistant to damage from These products are resistant to damage from chlorides and sulfates in Middle Eastern soils. (Collins-FIRL) W77-08586

HISTORY AND DEVELOPMENT OF THE OX-IDATION DITCH.

Process Biochemistry, Vol. 12, No. 1, p 3-6, January/February, 1977. 1 fig, 2 tab, 14 ref.

Descriptors: *Oxidation lagoons, History, Aeration, *Oxygenation, Liquid wastes, Sludge, Descriptors: Actation, "Oxygenation, Liquin wastes, Studge, Biochemical oxygen demand, Equipment, Sewage treatment, Nitrification, Industrial bomestic wastes, Waste water treatment. Identifiers: "Oxidation ditches.

The oxidation ditch, developed in 1953, became one of the most satisfactory sewage and industrial waste treatment methods. The system originally operated on an intermittent, fill and draw, princi-ple. Continuous operation systems were later employed, using either a separate final settlement tank or a divided leg, with each section acting as a final settlement tank. This is known as a split ditch. The basic design is a continuous ditch with trapezoidal cross-sections. Oxygenation, circula-tion, and ditch content mixing is accomplished by aeration rotors. After aeration, the mixed liquor passes to a settlement tank, and the settled sludge is returned to the ditch. At least twice the amount of dissolved oxygen needed for BOD removal is provided, allowing the sludge mineralization and nitrification. These operations are completely mixed systems. High BOD loads are easily absorbed with no adverse effects on effluent quality. The advantages of this treatment method include: the production of a well-stabilized, low-quantity activated sludge but no primary sludge; system flexibility for loads and temperature; low struction and maintenance costs: low noise levels: and easy adaptation to sites. Severe under- and over-loading/aeration, excessive shock loading, nutrient deficiency, and raw sewage septicity and temperature can contribute to problems of poor settling and compaction, or can create an activated sludge with large amounts of filamentous organisms. Incorrect operation will also lead to these problems. An optimal sludge age of 20 days was recommended for operating oxidation ditches. (Collins-FIRL) W77-08587

MODUFLEX SEWAGE TREATMENT PLANTS PROVIDE THE ANSWER TO GROWTH, Water and Pollution Control, Vol. 115, No. 4, p 36,

38, 39, April, 1977. 1 fig.

Descriptors: *Treatment facilities, *Design, Water quality control, Water purification, Growth rates, Human population, Equipment, Costs, Design criteria, Capital costs, Concrete construction, Biological treatment, Chemical treatment, *Waste water treatment, *Sewage treatment. Identifiers: *Moduflex system.

Unpredictable accelerations and decelerations of population growth rates create excessive or less than optimum flows that diminish sewage treatment plant performance. Smaller facilities have a smaller margin of allowable flow variation than larger ones. The Moduflex system was created as a solution to this problem. Modular concrete units can service 5 to 300 homes by progressive enlargement of the plant. Enlargement by unit addition and rearrangement of piping allows continued use of the original installations. The basic system is biological treatment with phosphorus removal, filtration, and nitrogen removal if desired. Unit processes include screening, comminution grind-ing, activated sludge treatment, chlorination, phosphorus removal by chemical treatment, secondary sedimentation, sludge digestion, and denitrification. When a community needs a full-scale treatment plant, the units may be disconnected, relocated, or sold. The manufacturer will contract to repurchase units, and will provide maintenance and monitoring under contract.
(Collins-FIRL) W77-08588

SODIUM BICARBONATE CAN SETTLE MANY WASTE WATER PROBLEM UPSETS, Church and Dwight Co., Inc., Piscataway, N.J.

N Barber

Pollution Engineering, Vol. 9, No. 4, p 57-59, April, 1977, 1 fig.

Descriptors: *Bicarbonates, *Anaerobic digestion, *Aerobic treatment, Treatment facilities, Hydrogen ion concentration, Methane, Carbon dioxide, Microorganisms, Equipment, Alkalinity, Nitrification, Sedimentation, Physical properties, Chemical properties, Biochemical oxygen demand, Odor, *Waste water treatment.
Identifiers: *Sodium bicarbonate.

Sodium bicarbonate has been used by engineers to prevent equilibrium disturbances in sewage treatment plants, It was used as a buffer to maintain the desired acid/alkali ratio for maintenance of an op-timum environment for microbial growth. In anaerobic systems, sodium bicarbonate can control pH, increase methane production, increase biodegradation rates, precipitate toxic metals, and aid solids concentration. It was also substituted for lime and other alkalis in aerobic processes, where it was able to control pH and alkalinity, enhance nitrification, improve BOD reduction, reduce or eliminate odors, enhance settling characteristics, and pretreat industrial wastes. (Collins-FIRL) W77-08589

ICI EFFLUENT SYSTEM TO BE USED IN

Environmental Health, Vol 85, No 2, p 43, February, 1977.

Descriptors: *Treatment facilities, Domestic wastes, Industrial wastes, Biological treatment, Separation, Economics, Environmental control, Municipal wastes, *Waste water treatment, Costs, Sewage treatment.

Identifiers: *ICI Deep Shaft Effluent Treatment System, Anglian Water Authority(England).

The Anglian Water Authority, England, has approved the construction of a treatment facility using the ICI Dept Shaft Effluent Treatment System. Mixed domestic sewage and industrial effluent will be treated. Completion of the system, involving biological treatment and solids separa-tion stages, is estimated for the summer of 1977. Costs are expected to be about 650,000 pounds. Wastes are circulated in a sunken shaft, treatment is accelerated, space is save, energy needs are reduced, and no odor is produced. Economical installation and a lessened environmental impact are the results of these advantages. (Collins-FIRL) W77-08590

REMOVING SOLUBLE METALS FROM WASTE WATER, A. V. Metzner.

Water and Sewage Works, Vol 124, No 4, p 98-101, April, 1977. 2 fig.

Group 5D—Waste Treatment Processes

Descriptors: *Metals, *Toxicity, *Industrial wastes, Municipal wastes, Pollutants, Waste treatment, Sludge treatment, Water pollution sources, Physical properties, Chemical properties, Recycling, Oxidation-reduction potential, Separation techniques, Sulfides, Chemical reactions, Sedimentation, Filtration, Ion exchange, Membrane processes, *Waste water treatment. Identifiers: *Soluble metals waste removal.

Soluble metal removal from waste water is necessary before process water can be discharged to municipal sewer systems or recycled. Five basic processes exist for metal removal: chemical oxidation and reduction, precipitation with clarification and/or filtration, evaporation, ion exchange, and membrane processes. Oxidation and reduction may be used to remove chromium and cyanides. Metals can be precipitated either as hydroxides or sulfides. Iron is commonly removed through precipitation. Chemical displacement and granular media filtration are effective treatment methods Evaporation may be cost efficient, depending on the processing objectives and is useful for metal recovery. Evaporative wastes are crystalline and reduce sludge handling costs. Ion exchange is employed for metal finishing bath purification, demineralization of flows for recycling, polishing effluents following primary treatment, and recovering methods. They, and in particular, reverse osmosis, are used primarily for recycling water and recovering or concentrating solubles. Only 75% of the effluent from this process is a purified product. The remainder must be treated further before discharge. (Collins-FIRL) W77-08591

RELIABLE PH MEASUREMENT WHEN EF-FLUENT CONDITIONS GET TOUGH,

Electrofact, Plymouth, Minn. For primary bibliographic entry see Field 5A. W77-08592

THE TRIALS AND TRIBULATIONS OF TREAT-MENT WORKS IN LOWER TRENT. Surveyor, Vol 149, No 4424, p 33, March, 1977.

Descriptors: *Treatment facilities, *Performance, *Water quality standards, Sewage effluents, Biochemical oxygen demand, Filters, Biological treatment, Filtration, Humus, Hydraulic design, Dewatering, Sedimentation, *Waste water treatment.

Identifiers: Severn-Trent Water Authority(England).

Investigations into problematic treatment facilities in the Severn-Trent Water Authority district, England, were reported. The first involved a mediumsized works which produced a poor quality effuent. It was found that BOD and suspended solids values were growing worse. The rectangular filter media were large and flat, and surface film growth had developed at the centers only. BOD maxima were found when the distributor was at the ends of the bed. Additional filter capacity was required and suggested remedies included using existing beds in a new filter and replacing the old media with new. Tests are being conducted to determine the effectiveness of these suggestions. The second facility was, again, experiencing difficulties of poor effluent. Hydraulic overloading of humus tanks was the problem. Trial solutions included using storm water tanks as secondary humus tanks, and recirculating the unsettled filter effluent. Both methods were successful. Reduction of hydraulic loads to the humus tanks reduced upward flow rates, improved solids removal, and positively affected settling characteristics of the treated suspension. At another plant, effluent problems seemed to be caused by the use of dewatering concentrators, which treated fibrous materials, on an effluent containing much fine material. Effluent quality improved when a belt press was used to replace the concentrator. (Collins-FIRL) W77-08593

HORSHAM'S SEWAGE WORKS, Water and Waste Treatment, Vol. 20, No. 3, p 23, March, 1977.

Descriptors: *Humus, *Filters, *Treatment facilities, Pumping plant, Construction, Dewatering, Construction materials, Concrete, Water purification, *Waste water treatment, *Filtration.

Identifiers: Horsham(England).

A sewage treatment plant is being constructed in Horsham, England, which will include four human tanks and filter beds. Design capacity is for a population of 95,000. A single wide cutting was made in which the 25.9 meter diameter human tanks and the ADF pumping station were built. It will be possible to install four additional tanks. Asgmented shutter formed the outer ring of the humus tank bases and stiff concrete was used for the sloping bases. The tank walls were made of a steel shutter. Precast concrete was used for the effluent collection channels and the supporting columns. Additional treatment facilities include sedimentation tanks, biological filters, humus tanks, pumping stations, storm tanks, and sludge dewatering equipment. (Collins-FIRL)

PRE-TREATMENT IN THE SEWER, Water and Waste Treatment, Vol. 20, No. 3, p 15, March. 1977.

Descriptors: *Sewers, *Oxygen, Hydrogen sulfide, Water quality control, *Sewage treatment, Aerobic conditions, Biochemical oxygen demand, Performance, Organic matter, *Waste water treatment, Testing, *Pre-treatment(Water).

Pretreatment of sewage by sewer oxygenation was tested. The Wessex Wat er Authority in England and a supplier of treatment components developed the system which involves the injection of oxygen into sewers at a pumping main. About one ton of oxygen is injected per day to treat aerobic conditions within the sewer in order to allow microbial activity for reducing the organic pollution load. Final effluent was improved by 30-60% after treatment in a plant which exhibited previous overlaoding. Costs for sewer oxygenation were substantially lower than construction costs for added conventional treatment facilities. (Collins-FIRL) W77-08596

PLANT CAPACITY TO INCREASE, Public Works, Vol. 108, No. 4, p 108, April, 1977.

Descript: "*Treatment facilities, *Oxygen, Performance, *Aeration, *Oxidation lagoons, Water purification, Reinforced concrete, Maintenance, Pumps, Water pollution control, *Waste water treatment, New Jersey, Identifiers: Wayne(NJ).

A pure oxygen treatment system is being installed at a treatment plant in Wayne, New Jersey, to increase treatment capacity by nearly 80%. A model 100 F30 module is to be placed in two aeration basins. Capacity will be increased from 1 to 1.8 mdg, while only one-third of the existing aeration basin volume will be used. The remaining volume will be used to double the clarification capacity. In the F30 system, a free-fall oxygenation technique creates a turbulence which mixes oxygen and waste water. Oxygen is mixed and dissolved in a turbulent waste water fall zone within a reinforced concrete module. Because the pump is the only moving part, maintenance of the system is minimal. (Collins-FIRL)

PERFORATED, VITRIFIED CLAY PIPE USED IN PEORIA FACILITIES,

For primary bibliographic entry see Field 8G. W77-08598

OXYGEN INJECTION FOR BATH'S SEWERS, Water Services, Vol. 82, No. 973, p 129, March,

Descriptors: *Oxygenation, *Sewers, Water quality, Costs, Testing, Hydrogen sulfide, Aerobic treatment, Biochemical oxygen demand, Temperature, Biological treatment, Microorganisms, *Water purification, *Waste water treatment, *Sewage treatment. Identifiers: Bath(England).

Bath, England, had been the site of sewer oxygenation testing to investigge the pre-treatment of sewage. The system has effectively improved treatment plant final effluent between 30 and 50%. The works previously operated under a 40% overload. The system, with an injection plant and oxygen, would cost about 19,000 pounds annually. whereas added conventional plant extensions would cost more than 500,000 pounds. With the injection of one ton/day of oxygen at the pumping station, aerobic conditions are created which last throughout the main. This aids microbial activity on sewer walls and in the main body to break down some of the organic pollution load. This load radically changes after primary settlement. Improved settling and sludge treatment have been shown. Summer operation is more effective because of higher temperatures and low river flows. (Collins-FIRL) W77-08599

HIGHER GAS YIELDS AND REDUCED RETENTION TIMES OBTAINED FROM ANAEROBIC DIGESTER,

Water Services, Vol. 82, No. 973, p 171-172, March, 1977.

Descriptors: *Gases, *Anaerobic digestion, *Sludge treatment, Heat transfer, Water purification, Pumps, Equipment, Filters, Sewage effluents, *Waste water treatment.

A Nash liquid ring vacuum compressor was used to improve the performance of an anaerobic sludge digester at an English treatment plant. The digester, with a capacity of 610,000 gallons, has its contents heated and agitated by units mounted on its exterior wall. Digesting sludge enters the bottom of the heating and mixing units under its own head pressure. Pressurized sludge gas is ued to push sludge up and to inject it back into the digester top. Rising sludge passes through hot water jackets which heat the sludge. Inadequate gas pressure or volume will neither lift the sludge by the required head nor maintain the required flow rates. Heat transfer and/or agitation of the digester contents will thus be negatively affected. This will in turn have a negative effect on sludge digestion and gas production. The liquid ring vacuum compressor was selected because it provides low-cost production of needed pressure and flow rate for good digester operation, reduced maintenance costs and down time with a minimum of wear on parts, and can provide 10 years of trouble-free operation before overhaul is necessary. The unit has provisions for complete shutdown if pressure falls below a pre-set level. Operation may be continuous or automatically controlled. Comparision of two six-month periods, before and after installation, indicated improved operation Retention time was reduced from 30.5 to 27.6 days even though a 10.8% more slud was handled. Feed sludge solids content and average ambient temperatures varied little. Gas production increased by 6.47% until gas flow meters were installed; afterwards, increases up to 29.9% were recorded, probably because of better mixing of the digester contents. This pump can also be applied to rotary vacuum filters and can be used to supply oil-free air for sub-surface aeration needs. (Collins-FIRL)

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5E. Ultimate Disposal Of Wastes

RECLAMATION OF ANTHRACITE COAL REFUSE USING TREATED MUNICIPAL WASTEWATER AND SLUDGE, Pennsylvania State Univ., University Park. School

of Forest Resources. For primary bibliographic entry see Field 5D. W77-08189

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SOURCES, CHARACTERISTICS AND TREATMENT AND DISPOSAL OF INDUSTRIAL WASTES CONTAINING HEXACHLOROBENZENE,

TRW Systems and Energy, Redondo Beach, Calif. For primary bibliographic entry see Field 5D. W77-08265

EFFECT OF DIP ON THE STORAGE OF FRESH WATER (OR THE DISPOSAL OF WASTE) IN A

SALINE AQUIFER,
Louisiana State Univ., Baton Rouge. Dept. of

Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-08288

A QUANTITATIVE STUDY OF ORGANIC CAR-BON DECOMPOSITION AND NITROGEN TRANSFORMATIONS IN SEWAGE SLUDGE-

SOIL SYSTEMS, Rutger - The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 5B.
W77-08291

PERSISTENCE OF MYCOBACTERIUM BOVIS BCG IN SOIL AND ON VEGETABLES SPRAY-IRRIGATED WITH SEWAGE EFFLUENT AND

Public Health Service, Cincinnati, Ohio. Div. of Microbiology.
For primary bibliographic entry see Field 5C.

W77-08525

THE SANITARY LANDFILL LEACHATE CON-TROL PLANT IN KOBE.

For primary bibliographic entry see Field 5D. W77-08534

SEABED SEWERS FOR HONG KONG. Watson (J. D. and D. M.) (Hong Kong). A. F. Short.

The Consulting Engineer, Vol. 41, No. 4, p 47, 50,

Descriptors: *Sewers, *Construction, *Planning, Pollution abatement, Outfalls, Waste disposal, Treatment facilities, Waste water treatment, Tunneling.

Identifiers: North West Kowloon(Hong Kong)

The planned system of submarine interceptor sewers for Hong Kong was described. The system was planned to replace direct discharge to the ocean, which has caused deterioration of beaches and local waters. Rapid population increases and industrial development have made the recomindustrial development have made the recommended waste disposal system necessary. Oxygen levels of the city's harbor had been falling below 50% saturation. The proposed scheme uses an interceptor sewer to collect wastes from the three main North West Kowloon drainage areas and convey them to a new treatment site. Treated effuents will be discharged into the harbor's main tidal stream. The interceptor sewer would be a twin circular sewer that crosses the harbor to the treatment site. Interceptor and outfall sewers to treatment site. Interceptor and outfall sewers to the treatment works will be gravity sewers. A main pumping station with degritting and coarse and fine screening facilities will lift sewage to ground level and on to treatment. A high rate biological filtration system with settlement and recirculation is to be employed, and a twin outfall with diffusers will be used for effluent discharge. Sludge treat-ment will involve heated anaerobic digestion in covered digesters for circulation and gas colleccovered digesters for circulation and gas collec-tion. Sludge disposal will be by ocean dumping. In-vestigations are continuing for development of un-derwater construction by tunneling and immersed tube techniques. The treatment facility is to be constructed on reclaimed land and the entire system must be able to withstand the worst exremes on weather, such as typhoons. (Collins-FIRI.) W77-08555

BREAKING DOWN SOLID AND LIQUID WASTE TO FORM A FERTILIZER--BY INOCU-LATION WITH SELECTED FUNGI AND FER-MENTATION.

Netherlands Patent NL 7608-433. Issued February 2, 1977. Derwent Netherlands Patents Abstracts, Vol. Y, No. 8, p D5, April 1, 1977.

Descriptors: *Patents, *Solid wastes, *Liquid wastes, *Fertilizers, *Fungi, *Fermentation, Metals, Aeration, Domestic wastes, Industrjal wastes, Microorganisms, Recycling, Waste water

A patent was issued for a process to transform solid and liquid wastes, which are compressed or solid and liquid wastes, which are compressed or comminuted, into fertilizer. Ferrous metals are removed and the material is fermented at room temperature and inoculated with fungus, yeast, or mold. Milling and mixing after inoculation distributes the fungi through the material. It is then placed in a closed aerobic area. This method can be used to treat solid domestic waste and sludge from either domestic or industrial waste water reatment. Various feedstocks may be treated by this process. The resultant product is stable and has properties resembling natural manure. (Collins-FIRL)

SEWAGE DISPOSAL SYSTEM.

Australian Patent 478,238. Issued November 25, 1976. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol 46, No 44, p 4320, November, 1976.

Descriptors: *Patents, *Sewage disposal, Equipment, Waste treatment, Sewage treatment, Hydraulic engineering, *Waste disposal, Mechanical engineering, Waste water treatment.

A patent was issued for a sewage disposal system. It is composed of a main frame positioned at a selected above-ground level with at least one vertical shank secured to it that penetrates the ground cal shank secured to it that penetrates the ground to a chosen depth. An underground disposal tunnel is formed by an axially elongate foot attached to a plow at the shank's lower end. Servomechanisms vary the cross-sectional area of the tunnel during operation. A dispensing port is at the end of the flow path for sewage discharge into the tunnel. (Collins-FIRL) W77-08563

S. W.'S SLUDGE INCINERATION SCHEME, Water and Waste Treatment, Vol. 20, No. 2, p 14-15, February, 1977.

Descriptors: *Incineration, *Sludge disposal, Treatment facilities, Planning, Design, *Sludge treatment, *Waste water treatment, Engineering structures, Activated sludge, Water districts. Identifiers: South West Water Authority(England).

A sludge treatment and incineration plant has begun operation in the South West Water Authority district of England. The plant treats a sewage flow of nearly 1 mdg from a population of about 20,000. The plant was designed for a population of

50,000 and provisions have been made for future duplication. Financial considerations have placed rural portions of the treatment system in limbo. The pumping station has a 520 kw diesel generator to allay power failures. (Collins-Firl) W77-08570

KOWLOON SEWAGE TREATMENT AND DISPOSAL

For primary bibliographic entry see Field 5D. W77-08573

INCINERATION SOLVES TOUGH WASTE PROBLEMS.

Modern Power and Engineering, (Toronto, Canada), Vol 71, No 3, p 40, March, 1977.

Descriptors: *Incineration, *Waste treatment, *Waste disposal, Industrial wastes, Pollution abatement, Municipal wastes, Gases, Com-bustion, Oxidation, Economics.

Incineration is considered one of the best avenues for handling wastes. Advantages of the method in-clude: weight reduction, volume reduction, sterile residues, and production of recoverable heat. The necessary performance requirements for the appli-cation of incineration are an ability to consume a wide variety of materials, adequate pollution controls, compatible operating and capital costs for the system, high disposal capacity per square foot of floor area, and adequate ash residue removal. The operation of a large incinerator for a short time is most economical and disposal of very hazardous materials only is economical for opera-tions below 300 pounds/hour. Air pollution control is often a considerable cost factor. Improved incineration technology includes thermal incineration for gaseous wastes, direct-flame fume in-cinerators, slagging pyrolysis, and suspension burning of finely divided materials in a vortex fur-nace chamber. Continued development and design revisions will make incineration a more economi-cally sound treatment method. (Collins-FIRL) W77-08576

SLUDGE DEWATERING PRESS. Industrial Wastes, Vol. 23, No. 2, p 17, March-April, 1977.

Descriptors: *Dewatering, *Sludge treatment, Equipment, Sedimentation, Industrial wastes, Municipal wastes, Flocculation, Polyelectrolytes, Waste water treatment, Separation techniques.

Dry-solids cakes can be made with a sludge de-watering press from dilute sludge produced by the sedimentation of industrial and municipal waste water processes. There are three stages: draining water processes. There are three stages: draming of sludge pre-floculated with a polyelectrolyte; low-pressure pressing of the sludge between the drainage screen and a pressing screen, and pressing by a series of decreasing diameter perforated rollers with increase pressure gradually; and, finally, sustained high-pressure pressing by a series of one inch-wide belts which press the sludge against a perforated roller. (Collins-FIRL) W77-08581

FLUID BED FOR SEWAGE SLUDGE BURN UP, D. Martin.

Environmental Protection Survey, p 27, February,

Descriptors: *Incineration, *Sludge disposal, *Treatment facilities, Sedimentation, Separation, Filtration, Equipment, Oxidation, Sludge treatment, Oxygen, Temperature, Pumps, Dewastering, Pollution abatement, Operation and maintenance, *Waste water treatment, Sewage sludge.

Identifiers: Esher(England).

The sludge incinerator plant at Esher, England, burns organic matter within a fluid bed of sand.

Group 5E—Ultimate Disposal Of Wastes

Components of the installation are a mechanically raked screen, a detritor to remove grit, a primary sedimentation facility, biological filters, humus tanks, micro-strainers, and an oil-fired incinerator. Mechanical moving parts are not used so maintenance problems due to mechanical failure are avoided. A fail-safe system is employed to avoid mishaps from power failures. The fluid bed is a mixture of sand and gases in suspension, making an ideal environment for the thermal oxidation of an ideal environment for the thermal oxidation of sludge. Flexible feed pipes are used for the sludge to allow easy handling of blockages. Operation is on a continuing rather than batch basis. Dewatering is conducted by vacuum filtration and the pumps are reliable, accept liquid carryover and soft solids, are resistant to corrosion, have a cooling effect on explosive gas, and scrub dirty gas. Little maintenance is required for the pumps. The plant has lower odor levels than usual, clean stack and an absence of ash. (Collins-FIRL) W77-08582

TRENCHING SLUDGE MAY BE SAFE. Water and Wastes Engineering, Vol 14, No 4, p 17, April, 1977.

Descriptors: *Sludge disposal, *Trenches, Water pollution, Treatment facilities, Testing, Nitrogen, Heavy metals, Sludge digestion, Cadmium, Copper, Nickel, Zinc, Lead, Chlorides, Nitrates, Ammonium compounds, Waste water treatment.

Experiments involving the trenching of sludge have revealed no significant groundwater con-tamination. Digested and undigested sludge was placed in two-foot deep trenches. The levels of nitrate, chlorides, and ammonium were not considered hazardous. Sludge trenching is being used by the Washington Suburban Sanitary Commis-sion, District of Columbia. Trencing is effective for small plants treating less than one mgd sewage flows or serving cities with 10,000 people. Other tests showed lower nitrogen levels for undigested than for digested sludge. Both sludges had been in trenches for four years. Nitrogen levels for both sludge types were significantly lower after trenching than before the operation. It may be possible for economic savings to result from the elimination of the digestion process since un-digested sludge also has lower levels of heavy metals than digested sludge. (Collins-FIRL) W77-08594

5F. Water Treatment and **Quality Alteration**

STATES NEED FREEDOM TO INNOVATE (COMMENT ON PL 92-500).
Kansas Dept. of Health and Environment, For primary bibliographic entry see Field 6E. W77-08119

LET'S HAVE ACHIEVABLE 'SAFE' DRINKING

WATER, Illinois State Environmental Protection Agency, Springfield. Div. of Public Water Supplies. For primary bibliographic entry see Field 5G. W77-08127

APPARATUS FOR CONTINUOUS LIQUID-LIQUID EXTRACTION OF WATER WITH A

Aktiebolaget Tellusond, Goteborg (Sweden). (Assignee).

Nasaguel.

B. O. Josefsson, and M. Ahnoff.
U.S. Patent No. 3,996,140, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 284, December 7, 1976.

Descriptors: *Patents, *Chemical wastes, *Water treatment, *Water pollution treatment, Water quality control, *Separation techniques, Organic compounds, Polychlorinated biphenyls, Solvents, Solvent extraction. *Waste water treatment.

The increasing concentration of chemicals in waterways necessitates substantially continuous supervision of the content of certain chemicals such as oil and chlorinated hydrocarbon, particularly polychlorinated biphenyls (PCB). Since these chemicals occur in very small quantities, it has so far been difficult to develop a sufficiently reliable and robust apparatus suitable for operation at a sampling point in waterways or at sea. The object of this invention is to provide an apparatus which can be used for field work. It should also be possible to use the apparatus immersed below the surface of the water for separation in situ. The apparatus for extracting dissolved substances from water comprises an extraction vessel. A mixing container, open at the top is placed in the lower portion of the extraction vessel and contains stirring means. The extraction vessel contains a desired quantity of solvent. The water is added in a continuous flow and is mixed with the solvent. The lighter solvent phase rises to the top of the ap-paratus, while the heavier water phase is continu-ously withdrawn through an annular space between the mixing container and the wall of the extraction vessel. (Sinha-OEIS) W77-08264

ROLE OF POLYELECTROLYTES IN THE FIL TRATION OF COLLOIDAL PARTICLES FROM WATER AND WASTEWATER,

Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.

For primary bibliographic entry see Field 5D. W77-08339

FLUORIDE ANALYSIS OF WATER-TREAT-MENT-PLANT SLUDGES,

Auburn Univ., Ala. Dept. of Civil Engineering. W. H. Duke.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 091, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, December 1974, 62 p, 10 fig, 5 tab, 47 ref, 1 append. OWRT A-043-ALA(1).

Descriptors: *Sludge, *Fluorides, *Measurement, Dilution, *Distillation, Distribution system, *Water treatment, *Aluminum, Treatment facilities, Pollutant identification. Identifiers: Rapid mix, *Fluoride analysis.

A method for fluoride analysis of sludges was developed and verified using laboratory-prepared alum sludge. The developed method was then used to measure fluoride concentrations in sludges from selected water treatment plants. Inititally, three methods of fluoride measurement were sidered: the alizarin visual method, the SPADNS method, and the electrode method. Since none of the methods was directly applicable to the determination of fluoride in sludge, several modifica-tions were made. These modifications included dilution, acidification and distillation. Pretreatment of the sludge sample by distillation and the analysis of the fluoride content of the distillate by the conventional electrode method was determined to be a valid method for measuring fluoride concentrations in sludges. The effects on the distil-lation process of aluminum accumulation in the distillation reagent, the size of the sample to be distilled, and the aluminum concentration in sample were investigated. An aluminum accumulation of less than 184 mg and an aluminum concentration in the sample of less than 300 mg/l were determined not to interfere with fluoride recovery. A 100.0 ml sample size was also determined to yield the best results. Sludge samples from water treat-ment plants in which fluoride is added in the rapid mix and sludge samples from water treatment plants in which fluoride is added following filtra-tion were analyzed for fluoride. The addition of fluoride in the rapid mix results in high fluoride concentrations in the sludge and an aluminum carry-over to the distribution system. W77-08342

BACTERIOLOGICAL POLLUTION IN THE DRINKING-WATER OF JORDAN, Ministry of Health, Amman (Jordan). Dept. of

For primary bibliographic entry see Field 5B. W77-08454

HEALTH CONSIDERATIONS IN USE OF TER-

TIARY EFFLUENTS,
California Univ., Berkeley. Dept. of Biomedical
and Environmental Health Sciences.

Journal of the Environmental Engineering Division-ASCE, Vol. 103, No. EE1, p 37-47, February, 1977, 2 tab. 45 ref.

Descriptors: *Water reuse, *Public health, Toxicity, Bacteria, Viruses, Animal parasites, Chemical wastes, Inorganic compounds, Organic compounds, *Tertiarytreatment, *Waste water treatment. Water treatment.

Hazards to human health which might result from the reuse of highly treated waste effluents have two major sources, biological agents and chemical agents. These biological agents may be bacterial, viral, or parasitical in nature. Salmonella and Shigella are the most important enteric pathogenic Enteroviruses. hacteria encountered. adenoviruses, reoviruses, and the agent of infec-tious hepatitis are potentially the most important viruses involved. Many intestinal parasites are associated with waste water but the incidence of their occurrence is not well established. Inorganic or organic chemical agents may be either acutely or chronically toxic to populations. The analysis of chemical agents is more difficult, and they arise from a wider range of sources than biological agents. They are both natural and man-made. Another problem is the uncertainty concerning the fate of chemicals in water, which depends upon their stability and their biotransformation to more toxic forms. Other concerns involve the effects of water hardness and the impact of trace organics. Developments in analysis, epidemiologic studies, and treatment must become more definitive before extensive waste water reuse can be applied with guarantees of health safety. (Collins-FIRL) W77-08513

POLLUTION INDICATOR BACTERIA SOCIATED WITH MUNICIPAL RAW AND DRINKING WATER SUPPLIES.

Ontario Ministry of the Environment, Rexdale. Lab. Service Branch.

For primary bibliographic entry see Field 5A.

APPLICATION OF CORRUGATED SHEET SPRAYERS FOR WATER PURIFICATION (DIE ANWENDUNG VON WELLBAHNRIESLERN IN DER WASSERAUFBEREITUNG),

G. Nagel. GWF-Wasser/Abwasser, Vol 118, No 3, p 103-109, 1977. 14 fig, 1 tab, 4 ref.

Descriptors: *Water purification, *Aeration, *Spraying, Iron, Manganese, Separation, Performance, Oxygen, Carbon dioxide, Gases, Equipment, Pollutants, *Water treatment, Water quality control, Waste water treatment. Identifiers: *Corrugated sheet sprayers.

Results are presented of field experiments with corrugated sheet sprayers used to aerate raw potable water for the removal of iron and manganese. At an air-to-water ratio of 1:1, optimal results were obtained at flowthrough rates of 600-1,000 cu m/hr per sq m. The new process has the advantage of

providing for adequate oxygen concentration in the water without causing supersaturation or ex-cessive loss of CO2. This is because the water passes through a special degassing section after going through the aeration section. Test runs for several months showed no clogging in spite of considerable iron and manganese concentrations of up to 2.8 mg/l and 0.5 mg/l, respectively. (Takacs-FIRL) W77-08543

SEWAGE SLUDGE DISINFECTED BY ELECTRON-BEAM BOMBARDMENT. For primary bibliographic entry see Field 5D. W77-08580

5G. Water Quality Control

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m/hi ge of REORGANIZING POLLUTION CONTROL IN

Wessex Water Authority, Bristol (England). R. Toms.

Water Spectrum, Vol 8, No 1, p 23-28 (Spring-Summer 1976). 1 map, 2 chart, 8 photo.

Descriptors: *Pollution abatement, *Water quality control, Foreign countries, *Research facilities, Organizations, Population, Water supply, Sewage treatment, Waste treatment, Biological treatment, Effluents, Management, Tidal waters, Rivers, Sampling, Water policy, Water demand, Eutrophication, Inspection.

Identifiers: Corporations, Centralization, *United Kingdom, *Wessex Water Authority(Eng).

The United Kingdon reorganized its total concept of pollution control under a new corporate management image in 1974. The Water Act of 1973, which became effective April 1, 1974 established a Welsh National Water Development Authority and nine regional water authorities to cover all of England. The act combined wastewater collection, sewage treatment, river and water resources management, treatment and supply of public and industrial water, and included fisheries and water recreation as integrated components of a comprehensive management system under the control of a single authority. The 1974 Control of Pollution Act extends the powers of the regional authorities to all discharges into estuaries and the sea, and from boats. All consents, details and the sea, and from boats. All consents, details of samples and any subsequent action taken by a water authority will be made available for public scrutiny. The quality of water supplies has been given a high priority. Water research has been taken over by the newly formed Water Research Centre. Although the improved coordination possible under this new corporate management structure already appears to be more effective, several more years will be necessary to complete the settling out process. (Martin-Florida) W77-08111

STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR THE EX-PLOSIVES MANUFACTURING POINT SOURCE CATEGORY (PROPOSED RULES), Environmental Protection Agency, Washington,

Federal Register Vol 41, No 47, p 10186-88, March

Descriptors: *Explosives, *Federal Water Pollution Control Act, *Industrial wastes, *Effluents, *Water quality standards, Water pollution, Discharge(Water), Legislation, Administrative agencies, Regulation, Governments, Management, Monitoring, Water policy, Water pollution control, Water pollution sources. Identifiers: *Environmental Protection Agency(EPA), *National Environmental Policy Act, *Point source discharges, *Manufacturing operations, Effluent limitations, Effluent guidelines.

Under the Federal Water PollutionControl Act (FWPCA), the Administrator of the Environmental Protection Agency (EPA) is required to establish effluent limitations and guidelines for existing sources of effluents, standards of performance and pretreatment standards for new sources, and pretreatment standards for new sources, and pretreatment standards for existing sources, by certain dates as set by the Act. The Act requires that as of July 1, 1977, the effluent limitations for point source discharges must be within standards achievable for the best practicable control measures and practices as defined by ble control measures and practices as defined by the Administrator pursuant to section 304(b) of the Act. This proposed rule deals with both military and commercial explosives manufacturing point source discharges. Standards of performance are proposed for the manufacture of explosives sub-category under Subpart A of the rule and for the explosives load, assemble, and pack plants sub-category under subpart C of the rule. Comments on all aspects of the proposed regulation and suggestions as to alternative approaches that might better satisfy the detailed requirements of the Act are solicited by the EPA. (Sloan-Florida)

LEADVILLE MINE DRAINAGE TUNNEL ACT

For primary bibliographic entry see Field 6E. W77-08115

IRRIGATED AGRICULTURE: NONPOINT AND POINT SOURCE WATER POLLUTION, S. I. Hadeed.

Journal Water Pollution Control Federation, Vol 48, No 9, p 2116-19, September, 1976.

Descriptors: *Agricultural runoff, *Irrigation, *Irrigation efficiency, *Water permits, Irrigation water, Tailwater, Irrigation effects, Surface runoff, Leaching, Salinity, Water conveyance, Water pollution sources, Water conservation, Reepage control, Silviculture.
Identifiers: *Point sources, *Nonpoint sources,
*Tailwater recovery.

Irrigated agriculture results in point source pollution (discharges from any conveyance) and non-point source pollution (unconfined discharges). point source pollution (unconfined discharges). The primary cause of nonpoint source pollution is undefined surface runoff from irrigated agriculture. Nonpoint source pollution problems vary from region to region. In the West, leaching causes increased water salinity. In the Central States, feedlot runoff increases water nutrients. The Environmental Protection Agency (EPA) has recently proposed regulations to expand its permit subports over all point sources in concentrated recently proposed regulations to expand its permit authority over all point sources in concentrated feedlot operations, agriculture and silviculture. Agricultural nonpoint sources are still largely unregulated. The National Commission on Water Quality (NCWQ) has proposed to Congress a series of plan to control irrigation-related water pollution including salinity alleviation projects, better water delivery systems such as lined canals to minimize seepage losses during diversion, and better farm water management techniques such as all water recovery or recycling to conserve supply tail water recovery or recycling to conserve supply and increase water-use efficiency. The EPA studies in the Upper Colorado River Basin show that cost-effective technology is rapidly be-coming available to control pollution from irrigated crop production. (Denker-Florida) W77-08116

OPERATION AND IMPACT OF NPDES IN RE-GION II, PART I, Environmental Protection Agency, New York.

Caribbean Construction Grants Branch. W. J. Muszynski, and T. J. Olenik. Water and Sewage Works, Vol. 123, No. 5, p. 62-65, May, 1976, and No. 6, p. 93-95, June, 1976.

Descriptors: *Federal Water Pollution Control Act (FWPCA), *Legislation, *Permits, *Municipal

wastes, *Discharge(Water), Regulation, Legal aspects, Water treatment, Water law, Effluents, Political aspects, Pollutants, Discharge(Water), Financial feasibility, Administration, Water pol-icy, Grants, Government finance, Economics, Treatment, Sewage treatment, Financing, Governmental interrelations

mental interrelations.
Identifiers: *Federal Water Pollution Control Act
Amendments of 1972, National Pollution
Discharge Elimination System, Combined flow,
Economic impact, Sewage management, Municipal dischargers.

In establishing the National Pollutant Discharge Elimination System (NPDES) permit program Congress has created an instrument for enforcement of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. In Region II, one of the largest and most important sections in terms of municipal dischargers, problems encountered by NPDES have centered around the funding issue, the pretreatment of industrial wastes, com-bined flow, and the lack of discharge information. To qualify for a permit, an existing treatment plant To qualify for a permit, an existing treatment plant must meet standards dictated by the Environmental Protection Agency (EPA). These requirements are generally more stringent than previously required under state programs. Some provisions, however, are made for issuance of permits with special conditions for plants that do not meet current sandards. The NPDES program has had significant economic impact, illustrated by reference to specific cases. From the study of Region II, it is apparent that many municipal dischargers will not meet the July 1, 1977 deadline. However, the success of the NPDES program should not be measured strictly in terms of this deadline. Instead the program should be judged by its effect on the grant program, increased efficiency of existing plants, program, increased efficiency of existing plants, and the collection of more reliable data. (Petruff-W77-08117

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 REACH POLLUT-ING ACTIVITIES OCCURRING ABOVE MEAN-HIGH WATER LINE (COMMENT ON U. S. V.

HOLLAND).
Florida State University Law Review, Vol 2, No 4, p 799-806, Fall 1974.

Descriptors: *Federal Water Pollution Control Act, *Navigable waters, *Rivers and Harbors Act, *Permits, Wetlands, Tidal waters, Tidal effects, Federal government, Water pollution control, Dredging, Tidal marshes, Judicial decisions, Estuaries, Estuarine environment, Federal ju-

Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Fill permits.

The 1972 Amendments to the Federal Water Pollution Control Act (FWPCA) as interpreted by a 1974 case, U. S. v. Holland, give the federal 1974 case, U. S. v. Holland, give the federal government greater authority to regulate the issuance of fill and dredge permits. First, Holland expands the definition of 'navigable' waters to include 'all waters of the U. S.' Formerly, under the Rivers and Harbors Act (RHA), fill permits were only required for navigable waters which did not include wetlands, marshes, and small feeder streams. The definition of 'navigable waters' in the Amendments encompasses these bodies. Second, it redefines the boundaries of navigable water. Under the RHA, the boundaries were affixed at the mean average high water mark for coastal the mean average high water mark for coastal waters and the mean high tidal line for bays and estuaries. Under the Holland interpretation the Amendments extend federal authority over water pollution beyond the mean high tidal line to the highest normal tide line. The net effect is that the ngness normal due line. The net effect is that use federal government can now prevent the entry of pollutants into any navigable waters when they are discharged from any point source. The impact of Holland may be limited by the Corps of Engineers' disagreement with the decision, since the Corps is exceptible for invited and the federal fede responsible for issuing dredge and fill permits. (Denker-Florida)

Group 5G-Water Quality Control

W77-08118

STATES NEED FREEDOM TO INNOVATE (COMMENT ON PL 92-500).
Kansas Dept. of Health and Environment, Topeka. For primary bibliographic entry see Field 6E.

W77-08119

U.S. ENVIRONMENTAL PROTECTION AGEN-CY ENVIRONMENTAL RESEARCH OUTLOOK FY 1976 THROUGH 1980 (REPORT TO CON-GRESS).

Environmental Protection Agency, Washington, D.C. Office of Research and Development. For primary bibliographic entry see Field 6G. W77-08120

TOWARD CLEANER WATER IN THE PACIFIC NORTHWEST AND ALASKA--THE NATIONAL WATER PERMIT PROGRAM.

Environmental Protection Agency, Seattle, Wash. Public Affairs Office. (1975), 15 p.

Descriptors: *Water permits, *Regulation, *Administrative agencies, *Pacific Northwest U.S., Legal aspects, Water law, State governments, *Alaska, Oregon, Idaho, Pacific coast region, Pacific Ocean, Toxins, Pollutants, Water pollution, Water pollution control, Federal Water Pollution Control Act, Water pollution treatment. Identifiers: *National Pollutant Discharge Elimination System, *National Water Permit Pro-gram, *Federal Water Pollution Control Act Amendments of 1972.

Region X of the Environmental Protection Agency (EPA) produced this pamphlet to inform the citizens of the four states in the region (Alaska, Idaho, Oregon, and Washington) of the functions of the National Pollutant Discharge Elimination System (NPDES), which is referred to as the National Water Permit Program. As part of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972, the NPDES is administered by the EPA in cooperation with state environmental agencies. The program requires that any person or organization discharging pollutants into waters of the United States must have a permit spelling out terms and timetables for the elimination of pollution. Approximately 2500 permits have been issued in the four states since the inception of the program in 1972. As a result, Biochemical Oxygen Demand pollutants are scheduled to be reduced 85 percent and suspended solids by 63 percent as of 1977. The federal government bears 75 percent the capital investment for treatment of sewerage facilities; states and communities are responsible for the balance. Industrial waste treatment costs must be borne by the industries themselves. (Sloan-Florida) W77-08121

FEDERAL CONTROL OVER WETLAND AREAS: THE CORPS OF ENGINEERS EX-PANDS ITS JURISDICTION,

W. F. Schneider. University of Florida Law Review, Vol 28, No 3, p 787-800, Spring 1976.

Descriptors: *Federal Water Pollution Control Descriptors: "Federal Water Pollution Control Act, "Federal jurisdiction, "Landfills, "Navigable waters, "Wetlands, Standards, Permits, Pollutants, Water pollution control, Water quality control, Non-navigable waters, Dredging, Jurisdiction. Federal government, Pollution abatement. Identifiers: "Interstate commerce, "Fill and dredge permits, National Pollution Discharge Elimination System, Fill operations, Fill permits.

Under the Federal Water Pollution Control Act (FWPCA) it is illegal to discharge any pollution into the waters of the United States without a per-

mit. The responsibility for overseeing the permit system is delegated to the Environmental Protec-tion Agency (EPA). Fill and dredge activities are also included within the scope of the FWPCA since destruction of a waterway can be as environ-mentally disruptive as pollution. Authority to ad-minister the fill and dredge permit system lies with the United States Army Corps of Engineers. Historically, the Corps' jurisidication has been limited to only navigable waterways but a recent court decision (U. S. v. Holland) removed that limitation. The Holland court did not define 'waters of the United States' but instead held that the commerce clause of the Constitution was the only limitation on the Corps' jurisdictional power. Recent cases have concluded that the Corps' ju-risdication extends over wellands and to the mean since destruction of a waterway can be as environrisdication extends over wetlands and to the mean high water mark as the boundary for navigable coastal water. In a legal memorandum, the EPA coastal water. In a legal memorandum, the EFA set guidelines for the Corps in implementing the National Pollution Discharge Elimination System (NPDES) permit program. The memo states that EPA will have jurisdiction over all waters affecting interstate commerce. (Denker-Florida) W77-08123

GOVERNMENTAL INTEREST IN PROTECT-ING BEACH FROM ENVIRONMENTAL DAMAGE THROUGH OVERUSE OUTWEIGHS DUE PROCESS RIGHT TO BATH NUDE For primary bibliographic entry see Field 6E. W77-08124

OIL AND WATER-A NEW LOOK AT THE UNIFORMITY DOCTRINE, For primary bibliographic entry see Field 6E. W77-08125

LET'S HAVE ACHIEVARLE 'SAFE' DRINKING

Illinois State Environmental Protection Agency, Springfield. Div. of Public Water Supplies. I. M. Markwood, and V. Randolph. Water and Sewage Works, Vol 122, No 5, p cover, 4, 89, (May 1975). 1 photo.

Descriptors: *Illinois, *Regulation, *Potable water, *Water quality standards, *Monitoring, Water supply, State governments, Administration, Maintenance, Design, Economic impact, Water, Water purification, Water treatment, Legislation, Public health. Identifiers: *Administrative regulations.

The State of Illinois strongly favors legislation which will assume safe drinking water. Finding that certain aspects of the proposed interim primary regulatons will interfere with progress toward that goal, the State opposes those aspects. The regulations are deficient in three general areas: (1) the classification of all water supplies under the same requirements; (2) reliance on monitoring alone to determine whether a water system is safe; (3) failure to leave monitoring administration to the state's discretion. Illinois believes regulations should depend more on design and maintenance than on monitoring. In addition, the economic burdens imposed on many small businesses to achieve a standard equal to public water supplies is unfair. Furthermore, the state feels that the value of the testing requirements must be weighed against the economics of taking the test in order that the best use will be made of the money available for up-grading water supplies. (Rieck-Florida) W77-08127

PL 92-500: PHOENIX V. THE EPA, Arizona State Water and Sewer Dept., Phoenix. A. F. Vondrick. Water and Wastes Engineering, Vol 12, No 6, p 52-54, 58, 60 (June 1975).

Descriptors: *Municipal wastes, *Federal Water Pollution Control Act, *Arizona, *Pre-treat-

ment(Water), Waste water(Pollution), Construction, Discharge(Water), Industries, Industrial wastes, Coliforms, Local governments, Treatment facilities, Municipal water, Regulation. Identifiers: *Effluent limitations, *Construction

Grant Program, *Discharge Permit Provisions, Industrial cost recovery, Phoenix(Ariz).

Municipal conflicts with federal bureaucracy in striving to accomplish pollution control have become classic confrontations. Phoenix, Arizona, for example, is caught in a web of frustration created by the directives of the Federal Water Pollution Control Act (FWPCA). For more than forty years the city has treated and recycled wastewater plant effluents. Despite its history of local water plant effluents. Despite its instory of local water pollution control, pre-dating federal regulation, Phoenix has been lumped with other cities for which the Environmental Protection Agency (EPA) prescribes rules to abate pollution. The major problems with FWPCA rules and regulations center around two areas: the construction grant program and the National Pollution Discharge Elimination System (NPDES). More specifically, criticism is aimed at forcing industries with their own pre-treatment facilities to be sub-jected to industrial cost recovery. Further criti-cism questions the validity of fecal coliform as an index to determine secondary treatment efficiency. Instead of painting every locality with the same broad brush, the regulations augmenting the FWPCA should be reasonably interpreted in a flexible manner to avoid arbitrary, and somewhat irrational, regulation. Local circumstances should be considered with success being measured by the elimination of pollution and not merely by compliance with the rules. (Rieck-Florida) W77-08128

ENVIRONMENTAL PROTECTION THROUGH THE COMMON LAW, Calgary Univ. (Alberta). Faculty of Environmental

For primary bibliographic entry see Field 6G.

W77-08133

COMPLIANCE WITH THE PROVISIONS OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED IN 1972. For primary bibliographic entry see Field 6E. W77-08153

NEW WATER LEGISLATION-DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION, Wyoming Univ., Laramie. Coll. of Law. For primary bibliographic entry see Field 6E. W77-08188

THE EFFECT OF AERATION OF WATER JET SPREADING, Connecticut Univ., Storrs. Inst. of Water

For primary bibliographic entry see Field 8B. W77-08197

EFFECTS OF PH AND INORGANIC CARBON CONCENTRATIONS UPON COMPETITION BETWEEN ANABAENA FLOS-AQUAE AND SELENASTRUM CAPRICORNUTUM, Maine Univ., Orono. Dept. of Civil Engineering. For primary bibliographic entry see Field 5C. W77-08200

WATER ALLOCATION AND PRICING FOR CONTROL OF IRRIGATION-RELATED SALINITY IN A RIVER BASIN, California Univ., Los Angeles. Dept. of EngineerOdi wiii miticio sol gli man rei on an the col sol gly

ing Systems. C. R. Scherer.

Water Resources Research, Vol. 13, No. 2, p 225-238, April 1977. 10 fig, 5 tab, 49 ref. OWRT B-170-CAL (4).

Descriptors: "Water allocation(Policy), "Water quality control, "Salinity, "Irrigation, "Dynamic programming, "Economic efficiency, Optimization, Water districts, Water rights, Pricing, Control, River basins, Downstream, Agriculture, Decision making, Operations research, Legal aspects, Hydraulics, Equations, Water yield, Watersheds(Basins), Constraints, Mathematical

Identifiers: Benefit maximization, Western United States.

States.

The optimal allocation of water to sequential irrigators is considered with emphasis on downstream salinity damages caused by salt-concentrating mechanisms inherent in irrigated agriculture. Outlined is a physical hydrosalinity model that characterizes multi-irrigation district rivers and is used to develop a dynamic programming framework for the efficient allocation of water among districts. The focus is upon returns (maximization of net benefits) to farmers as a function of quantity and quality of water diverted and upon developing an operational model on which a viable water rights pricing scheme could be based. The allocation is achieved using the dynamic programming framework with decision variables of amount diverted, land irrigated, and amount of irrigation canals lined. This framework is used to investigate a scheme whereby water is purchasers are financed by downstream use solely as a dilutant. The basis is established in principle for an operational water rights market where all purchasers are financed by downstream beneficiaries, this framework would facilitate discovery of reallocations that are Pareto superior to existing allocations and computation of the individual purchase offer that must be made to each district reallocations that are Pareto superior to existing allocations and computation of the individual purchase offer that must be made to each district to compenstate it for acreage withdrawn from irrigation under these new allocations in order to reduce salinity impact on the downstream users. Four example solutions are presented. Probably, better resolution of salinity management problems will evolve if trade-offs and 'efficiency forntiers' are correctly perceived. (Bell-Cornell) W77-08213

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SORPTION AND FLOW OF CARBON DIOXIDE AND SOME HYDROCARBONS IN A MICROPOROUS CARBON MEMBRANE, Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry. For primary bibliographic entry see Field 5A. W77-08232

METHOD OF DISPERSING OIL IN WATER, Imperial Chemical Industries Ltd., London (England). (Assignee). P. G. Osborn, P. F. Nicks, and M. G. Norton. U.S. Patent No. 3,996,134, 7 p, 6 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 282, December 7, 1976.

Descriptors: *Patents, *Oil spills, Oil Pollution, *Water pollution sources, *Water pollution conrol, Dispersion, Chemical compounds, Resins. Identifiers: *Oil slicks.

One method of disposing of an oil slick is to disperse the oil in water as fine and stable droplets which are then less of a hazard to bird and marine life and which are more readily broken down by microbiological action. For dispersion to be effective. microbiological action. For dispersion to be effec-tive, however, it is necessary to use a very effi-cient dispersing agent which has long lasting action so that the oil droplets do not readily re-ag-glomerate to a slick. This invention provides a method of dispersing oil slicks which is efficient and in which the dispersed oil droplets do not readily coalesce. The method is not limited to this one use but can be used in secondary oil recovery and ter-sand oil recovery. It comprises contacting and tar-sand oil recovery. It comprises contacting the oil and water with an alkyd resin in which one component of the resin is the residue of a water-soluble polyalkylene glycol such as a polyethylene glycol. (Sinha-OEIS) W77-08260 PUMP-FILTER FOR BILGE WATER.

P. Jakubek, and K. Biswanger. U.S. Patent No. 3,996,136, 13 p, 12 fig, 2 tab, 14 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 283, December 7, 1976.

Descriptors: *Patents, Water pollution, *Water pollution treatment, Oil pollution, *Oily water, Water quality control, Separation techniques, Filtration, Equipment.
Identifiers: *Bilge water treatment.

The polluted liquid is fed into a separation chamber in the bottom of a two-part housing where it undergoes a preseparation so that the liquid pollutant rises to the top of the liquid in this separation chamber. A pump has its intake con-nected to this separation chamber at a lower region and has its output connected to an upper compart-ment of a compensation chamber above the ment of a compensation chamber above the separation chamber and subdivided into this upper compartment and a lower compartment by a filter. The liquid passes vertically down through this filter in the compensation chamber and is then withdrawn in a highly pure state from the lower compartment. The pump is only operated when the liquid level in the separation chamber is above a predetermined minimum level.

BIOCHEMICAL TRANSFORMATION AND DETOXIFICATION OF MERCURY IN AQUATIC ENVIRONMENT,

Georgia Univ., Athens. Dept. of Food Science. For primary bibliographic entry see Field 5C. W77-08289

DETECTION OF PHOSPHATE ADSORPTION ONTO COAL HUMIC ACIDS, Missouri Univ.-Columbia. Dept. of Chemistry. For primary bibliographic entry see Field 5A. W77-08294

27TH NORTHWEST FISH CULTURE CONFERENCE.

For primary bibliographic entry see Field 2I. W77-08309

DIFFUSE AGRICULTURAL POLLUTION: THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS.

Wisconsin Univ. Madison. Dept. of Agricultural Economics. For primary bibliographic entry see Field 5B. W77-08329

ECONOMIC IMPACTS OF CONTROLLING WATER QUALITY IN AN IRRIGATED RIVER

Washington State Univ., Pullman. Dept. of Agricultural Economics. G. H. Pfeiffer.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-268 113, Price codes: A13 in paper copy, A01 in microfiche. PhD Thesis, 1976. 273 p. 18 fig. 60 tab, 105 ref, 3 append. OWRT B-059(WASH)(1). 14-31-0001-5125.

Descriptors: Irrigation, "Return flow, Water quality control, "Irrigation efficiency, "Economic impact, River basins, Pollutant abatement, "Washington, Environmental control, "Water temperature, Sediment transport, Costs, Nitrates, Nitr Nitrogen. Identifiers:

identifiers: *Yakima River basin(Wash),
*Sediment loss, *Nitrate nitrogen, *Non-point pollution sources.

The nature of non-point discharges of effluents into the environment makes direct control of environmental quality impossible. Economic theory suggests, however, that efficient pollution abate-

ment is possible by controlling the use of those in-puts functionally related to environmental degradation rather than controlling the effluents themselves. Water quality degradation caused by irrigation return flows is an example of the effects of non-point discharges which can only be con-trolled by restrictions on input use. The objective of this study was to examine the economic impacts of this study was to examine the economic impacts of policies affecting agriculture which would improve water quality in the Yakima River. The Yakima River Basin is an intensively cultivated river basin in which the major user of river water is irrigated agriculture. Three environmental quality parameters were identified for evaluation: nitrate nitrogen concentration in the river, water mitrate nitrogen concentration in the river, water temperature in the river, and annual sediment lost for farms in the Basin. The results show that sub-stantial improvements in environmental quality in the Yakima River are possible, but only at signifi-cant social and producer costs. These costs must be compared with the benefits of improved en-vironmental quality in order to determine ap-propriate abatement policies and water quality standards W77-08332

METHODOLOGY AND DATA FOR ANALYZ-ING QUANTITY, QUALITY AND ECONOMIC ASPECTS OF MINIMUM STREAMFLOWS, AP-

PENDICES, VOLUME 2,
Washington Univ., Seattle. Dept. of Economics.
J. A. Crutchfield, B. W. Mar, J. W. Crosby, III, and J. F. Orsborn.

and J. F. Orsborn.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-268 065, Price codes: A14 in paper copy, A01 in microfiche. Washington Water Research Center, Pullman, Dec 1975.

Descriptors: *Methodology, *Water quality, *Water supply, *Economics, Flow, *Low flow, Minimum flow, Water allocation(Policy), Competing uses, *Legal aspects, Preferences(Water rights), *Washington, *Water conservation, Recreation, Aesthetics.

Identifiers: *Instream flow.

The study was undertaken to develop methodologies for establishing the legally prescribed minimum flows and levels in streams and lakes in minimum flows and levels in streams and lakes in the State of Washington. As more states attempt to preserve their natural resources through the enactment of legislation, their efforts provide a valuable experience record. But, in establishing 'minimum' or 'base' flows in streams for the protection of natural values, the development of methodology to apply the laws has not been accomplished and is of particular concern to both state and federal agencies. The overal objective of this study has been to develop methods for analysis of the quantity, quality and economic factors associated with the establishment of low-flow criteria for consertity, quality and economic factors associated with the establishment of low-flow criteria for conser-vation, recreation and aesthetic purposes. Volume 1 of this report (see W74-07847) was prepared to describe various aspects of the problems as-sociated with the establishment under law of minimum streamflows for preservation of in-stream values. Volume 2 provides more detailed information and data on those aspects.

CHANNELIZATION: ENVIRONMENTAL, GEOMORPHIC AND ENGINEERING ASPECTS, North Carolina Univ. at Charlotte. Dept. of Geography and Earth Science. For primary bibliographic entry see Field 8D. W77-08352

THE IMPORT - EXPORT CLAUSE AND CONTROL OF OIL POLLUTION: REGULATORY FEE IMPOSED PURSUANT TO THE POLICE POWER,

P. J. Lipscomb. Boston University Law Review, Vol 54, No 3, p 610-36, May 1974.

Group 5G-Water Quality Control

Descriptors: *Maine, Oil pollution, *Oil spills, *Consitutional law, Shore protection, Coasts, Harbors, Water pollution sources, Legislation, Legal aspects, Environmental control, Federal government, Public health, State jurisdiction, Ships.

Identifiers: *Hazardous substances(Pollution), Supertankers, Marine environment, Absolute liabili-

The Maine Legislature enacted the Oil Discharge Prevention and Pollution Control Act of 1970 in recognition of the fact that, as the only East Coast state capable of accommodating the increased traffic of oil supertankers, the risks of oil spills on Maine's shores are likely to increase. Under the Act, the state's oil terminals are required to purchase a license, the cost of which is directly re-lated to the number of barrels of oil transferred over water. The fund thus created covers the cost of oil spill clean-up operations and damage awards to private parties, with the state recouping these costs from the terminals involved based on an absolute liability provision. The validity of the statute was challenged by terminal operators, and the question of whether the Maine high court properly held the fee to conform to the Import Export Clause of the Constitution is the subject of this case comment. The author, however, postulates while it is a direct levy, it should be considered valid, because it is not a revenue measure. but is enacted pursuant to the state's police power to protect the public welfare. (Jones - Florida) W77-08354

EPA FOCUSES ON MUNICIPAL ENFORCE-MENT,

For primary bibliographic entry see Field 6E. W77-08355

TIMBER PRODUCTS PROCESSING POINT CATEGORY **EFFLUENT** SOURCE GUIDELINES AND STANDARDS,

Environmental Protection Agency, Washington, DC

Federal Register, Vol. 41, No. 238, p. 53930-38, December 9 1976

Descriptors: *Federal Water Pollution Control Act(FWPCA), *Lumbering, *Waste water treatment, *Water quality standards, *Regulation, Standards, Administrative agencies, Federal government, Chemicals, Industrial wastes, Toxicity, Effluents, Costs, Economic impact, Water quality control, Pollutants, Public health, Pollution, Pulp and paper industry, Wood wastes. Identifiers: *Administrative regulations, *Timber products processing.

The Environmental Protection Agency (EPA) has promulgated in interim final form effluent limitations and guidelines for existing sources and standards of performance for new sources for the timber products processing point source categories. The EPA has received and commented upon statements from the public-at-large concerning the proposed regulations. The Commissioner expects no adverse economic effect for any member of the timber processing subcategory other than the wood preserving subcategories as a result of the regulations. Specific pollutants curtailed by the regulations include phenolic, COD and oil. Practices and procedures suggested to reduce the quantity of effluents include the elimination of equipment and piping leaks, the minimization of spills by the use of good housekeeping techniques, recovery and reuse of contaminated water, and segregation of contaminated and uncontaminated water streams. The estimated expense for control of waste water pollutants is a \$138,500 capital cost and a \$52,480 annual cost. (Moorhouse-Florida) NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY PRETREAT-MENT STANDARDS.

Environmental Protection Agency, Washington, DC

Federal Register, Vol 41, No 242, p 54850-54, December 15, 1976.

Descriptors: *Federal Water Pollution Control Act(FWPCA), *Metals, *Aluminum, *Copper, *Waste water treatment, *Water quality standards, Regulation, Standards, Administrative agencies, Federal government, Cadmium, Zinc, Chemicals, Water quality control, Pollutants, Economic impact, Pollutions, Costs, Effluents, Toxicity, Industrial wastes.

Identifiers: *Administrative regulations. Nonferrous metals manufacturing.

The Environmental Protection Agency (EPA) has established effluent limitations and guidelines in interim final form for the nonferrous metals manufacturing point source category. The public were afforded an opportunity to respond and the EPA has summarized their comment. The director anticipates that the economic effects of these regulations will be minor. Copper and aluminum compose the major industries in the nonferrous metals manufacturing category. Type of product, raw waste load, type of manufacturing process and treatability of waste water were all considered in determining the standards. Wastewater pollutants sought to be curtailed by these standards are pH, COD, zinc, copper, cadmium, chloride, ammonia, and oil and grease. Technology suggested in order to reduce toxic effluents included settling and grease traps as well as in-plant reuse and recycle waste water processes. (Moorhouse-Florida)

TOXIC POLLUTANT EFFLUENT STANDARDS FOR RENZIDINE.

Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 42, No 8, p 2617-21, January

Descriptors: *Federal Water Pollution Control Act(FWPCA), *Chemical industry, *Water quality standards, Regulation, Standards, Chemicals, Industrial wastes, Effluents, Costs, Monitoring, Water quality control, Public health, Federal government, Legislation, Pollutants, Water pollu-tion control, Environmental effects, Administrative agencies, Cost-benefit analysis, Textiles, Water pollution sources, Navigable waters.
Identifiers: *Carcinogens, *Benzidine, Adminis-

trative regulations.

Pursuant to section 307(a)(2) of the Federal Water Pollution Control Act (FWPCA) of 1972, the Environmental Protection Agency (EPA) proposed toxic pollutant effluent standards for the chemical benzidine. The regulations establish effluent standards for all manufacturers of benzidine and benzidine-based dyes and the principal users of benzidine-based dyes who discharge directly into navigable waters. Standards are proposed for both existing and new sources. The principal applicator categories, and those which are covered in the EPA's standards, are manufacturers of paper goods, leather goods and textile goods who use benzidine-based dyes in their processes. Despite objections over the cost of monitoring from chemical manufacturers, the EPA believes the cost of mass balance monitoring is quite small. No evidence was introduced at the hearings to the contrary. Whatever minimal costs there may be would appear to be justified in order to insure that the industry continues to comply with the EPA's effluent standards for benzidine. This would assure the requisite protection of human health from exposure to this proven carcinogen is being provided. (Rieck-Florida) W77-08359

EFFLUENT GUIDELINES AND STANDARDS FOR FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, NITRIC ACID SUB-CATEGORY.

Environmental Protection Agency, Washington,

Federal Register, Vol 41, No 11, p 2386-88, Janua-

Descriptors: *Fertilizers, *Nitrogen compounds, *Ammonium compounds, *Agricultural chemicals, Water pollution sources, Water pollution, Administrative agencies, Federal government, Effluents, Industrial wastes, Liquid wastes, Waste water(Pollution), Regulation, Ships, Nitrogen, Ammonia, Organic compounds Identifiers: *Administrative regulations, *Effluent limitations.

The Environmental Protection Agency (EPA) has amended 40 CFR 418 concerning the Fertilizer Manufacturing Point Source Category. Previous regulations for the nitric acid subcategory of the fertilizer manufacturing point source category required no discharge of process wastewater pollutants into navigable waters. As a result, twelve fertilizer manufacturers joined in a petition for judicial review of the nitrogen fertilizer regulations. The companies demonstrated a need for a leaks and spills amendment to the regulations. The EPA rejected such an approach and instead amended the regulations to allow limited discharges from the sources that were identified. Shipping losses are excluded from the new regulations. Good housekeeping, prompt and regular maintenance, and careful operations will tend to minimize the losses from shipping. (Moorhouse-Florida)

SOVEREIGNTY AND THE CONTROL OF WATER POLLUTION,

D. G. Lehv.

W77-08360

Environmental Affairs, Vol 2, No 2, p 421-43 (Fall

Descriptors: *Massachusetts, *Governmental interrelations, *Local governments, *State governments, Legal aspects, Governments, Administration, Legislation, Government finance, Regulation, Water law, Pollution, Costs, Taxes, Financing, Judicial decisions, Penalties(Legal), Waste water(Pollution).

Identifiers: Mandamus, Sovereignty, Police power, Fines.

Grafton, Massachusetts, by its refusal to appropriate funds for the construction of a municipal sewage treatment facility has clearly demonstrated the need for different methods of judicial and administrative enforcement of state directives. That waste treatment and other facets of pollution control are within the scope of the police power of the state is uncontested. The conflict arises when the exercise of that power contravenes municipal determinations. Massachusetts courts have long recognized the superiority of the state in such conflicts. The existing judicial remedies of civil contempt, criminal contempt, and criminal prosecution have proven ineffective. Imposition of fines is one alternative. However, Grafton ignored a \$2000 fine. The issuance of a writ of mandamus is unlikely, since construction of municipal facilities is a discretionary duty. Another alternative would be to treat the municipality as a judgment-debtor of the state. Thus mandamus could compel the levy-ing of taxes for payment of the debt, or city funds could be sequestered. Cities may be immune to these methods, however. Perhaps the only viable remedy is legislative enactment of a general law providing for the creation of autonomous sewer authorities whenever municipalities refuse compliance with state orders to abate pollution. (Moorhouse-Florida) W77-08366

LEGAL CONTROL OF CONSUMPTIVE WATER USE IN PENNSYLVANIA POWER PLANTS.

PLANIS, Pennsylvania Dept. of Environmental Resources, Harrisburg. Office of Enforcement. For primary bibliographic entry see Field 3E. W77-08368

PROPOSED EFFLUENT GUIDELINES AND STANDARDS FOR IRON AND STEEL MANUFATURING.

Environmental Protection Agency, Washington,

Federal Register, Vol 41, No 61, p 13015-30, March 29, 1976.

Descriptors: *Effluents, *Steel, *Iron alloys, *Structural steel, *Iron, Metals, Iron compounds, Administrative agencies, Regulation, Federal government, Wastes, Water pollution sources, Industrial wastes, Liquid wastes, Waste water(Pollution), Waste water disposal, Heavy metals, Metallurgy.

metals, Metallurgy.

Identifiers: *Administrative regulations, *Effluent

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The Environmental Protection Agency (EPA) has proposed effluent limitations for existing sources, standards of performance and pretreatment standards for new sources concerning the iron and steel manufacturing point source category. Specific operations affected hereby are the hot forming-primary subcategory, the hot forming-section subcategory, the hot forming-flat subcategory, the pipe and tube subcategory, the pickling-sulfuricacid-batch and continuous subcategory, the scale removal-kolene and hydride subcategory, the scale removal-kolene and hydride subcategory, the continuous aldaline cleaning subcategory. The proposed regulations are in accordance with the goal of the best practicable control technology available by July, 1977. (Moorhouse-Florida)

EFFLUENT GUIDELINES AND STANDARDS FOR CANNED AND PRESERVED FRUITS AND VEGETABLES POINT SOURCE CATEGORY, Environmental Protection Agency, Washington,

B.C. Federal Register, Vol 41, No 75, p 16272-86 April 16, 1976.

Descriptors: *Federal Water Pollution Control Act, *Canneries, *Water quality standards, *Regulation, *Waste water treatment, Standards, Administrative agencies, Federal government, Water pollution sources, Water pollution control, Effluents, Industrial wastes, Water quality control, Industrial plants, Industrial production, Industrial water, Economic impact, Biochemical oxygen demand.

Identifiers: *Administrative regulations, *Effluent limitations, Effluent guidelines, Point sources(Pollution), Pretreatment standards(Effluent).

The Environmental Protection Agency has established final regulations setting guidelines and standards for effluent limitations for the canned and preserved fruits and vegetables point source category. Significant changes from the proposed regulations include a more accurate and representative characterization of raw waste loads, a revision of the industry subcategorization and an easing of discharge limitations due to new data regarding treating systems. Limitations are established controlling the quantities of BOD5, and TSS and the quality of pH which may be discharged by fruit processing plants, vegetable processing plants and specialty foods processing plants. Specialty products include baby food, potato chips, ethnic foods, jams and jellies, mayonnaise, soups, and tomato-starch-cheese

canned specialties. The EPA has summarized the comments made on the regulations by members of the canned and preserved fruits and vegetables industries and has responded there to. (Moorhouse-Florida)
W77-08371

THE 1972 WATER POLLUTION CONTROL ACT: UNFORESEEN IMPLICATIONS FOR LAND USE PLANNING,

The Urban Lawyer, Vol 8, No 1, p 140-55 (Winter

Descriptors: *Waste water treatment, *Land use, *Sewage treatment, *Federal Water Pollution Control Act, Grants, Interceptor sewers, Sewage, Sewerage, Land development, Land management, Financial feasibility, Costs, Government finance, Financing, Local governments, Federal government, Political aspects, Planning, Long-term planning, Projections, Project planning. Identifiers: *Federal Water Pollution Control Act

Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Environmental impact statement

Title II of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) provides for grants for sewage treatment systems. Upon approval by the Environmental Protection Agency (EPA), areas having a substantial water quality control problem can receive up to 75 per cent of the cost of a regional treatment project. Encouraging areawide plans has had adverse effects on local land use control. Requiring that plans anticipate needs over a twenty year period has led to un-necessarily large and extensive sewage systems. Although the EPA has been reluctant to consider these implications of the FWPCA, there are three alternatives by which the EPA could influence local land use planning: (1) withold all funds for interceptor construction; (2) change the 75 percent grant to a matching formula; or (3) limit reserve capacity in a system to a specific fraction of initial flow. While the first alternative would result in more realistic population projections it could lead to decreased regionalization. The second alternative provides no control over the configuration of interceptors. Full 75 percent financing of a limited capacity system with additional capacity locally rapactry system with adultional capacity locally financed would provide a workable solution. Furthermore, local participation in planning stages could be increased by requiring public hearings and environmental impact statements exploring the adverse impact of expanded sewage treatment systems. (Moorhouse-Florida) W77-08373

REPORT ON WATER RESOURCES PROBLEMS OF WESTERN COLLIER COUNTY, FLORIDA AS AFFECTED BY THE GAC CORPORATION'S CANAL SYSTEM IN ITS GOLDEN GATE DEVELOPMENT PROJECT, Florida Univ., Gainesville. Coll. of Law.

Florida Univ., Gainesville. Coll. of Law. For primary bibliographic entry see Field 6E. W77-08380

PUBLIC HEARING REGARDING 180-DAY NOTICE TO THE SANTA FE LAND IMPROVEMENT COMPANY OF VIOLATION OF STATAND FEDERAL WATER QUALITY STANDARDS FOR THE INTERSTATE WATERS OF THE KANSAS AND MISSOURI RIVERS, HELD AT KANSAS CITY, KANSAS ON 13 JULY 1971. Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 924, Price codes: A04 in paper copy, A01 in microfiche. Transcript of Proceedings (1971), 70 p.

Descriptors: *Rivers and Harbors Act, *Environmental effects, *Sewage disposal, *Sewage treatment, *Administrative decisions, Kansas, *Missouri River, Missouri, Administration, Administrative agencies, Ultimate disposal, Sewage, Sewers, Disposal, Environmental control, Public health, Waste treatment, Wastes, Waste water disposal, Waste disposal, Water quality control. Identifiers: *Kansas River.

Discharge of untreated sewage into a navigable river is in violation of the Federal Water Pollution Control Act and the 1899 Rivers and Harbors Act. In June 1971 the Administrator of the Environmental Protection Agency (EPA) notified the Santa Fe Land Improvement Company of Amarillo, Texas, that its operations located on and discharging effluent into the Kansas River constituted violations of the established state and federal water quality standards. In an effort to solve the problem, an informal public hearing was held involving the EPA, representative of Kansas Department of Health, and Department of Boulevards, Parks and Streets, the City Attorney for Kansas City, Kansas, and, Santa Fe Land Improvement Company. The parties agreed that they would cooperate in arriving at a remedial schedule by which Santa Fe would connect its sewers to those of Kansas City. Hopefully this joint effort will solve the pollution problem and avoid costly litigation. If the matter is not satisfactorily resolved by voluntary action, an abatement action may be brought against Santa Fe pursuant to the Federal Water Pollution Control Act. (Josepher-Florida)

ENVIRONMENTAL LAW-APPLICATION OF THE REFUSE ACT OF 1899 TO CONTINUAL INDUSTRIAL DISCHARGES IS UPHELD WITHOUT FORMALIZED PERMIT PROCEDURES,

J. J. Burton, Jr.

Emory Law Journal, Vol 23, p 281-92 (1974). 78 ref.

Descriptors: "Judicial decisions, "Water pollution control, "Water permits, "Law enforcement, Industrial wastes, Navigable rivers, Pollution abatement, Legal aspects, Permits, Water law, Legislation, Navigation, Pennsylvania, Federal government, Industrial plants, Water pollution sources, Penalties(Legal), Legal review, Regulation. Identifiers: "Navigation obstructions, "Refuse Act

Identifiers: *Navigation obstructions, *Refuse Act of 1899, Defenses, Reliance, Corps of Engineers, Water Quality Act of 1965, Federal Water Pollution Control Act Amendments of 1972, Monongahela River.

In United States v. Pennsylvania Industrial Chemical Corp. (PICCO) the United States Supreme Court held that the absence of a formal regulatory permit program does not preclude prosecution for violation of the Refuse Act of 1899. However, relevant evidence of defendant's reliance on a limited construction of the statute by the agency responsible for its administration must be admitted. The Refuse Act has been subject to various interpretations. In 1966 the Supreme Court expanded the scope of the Act to include prohibition of all pollutant discharges into navigable waters regardless of their effect on navigation. The Court subsequently held that more modern legislation did not supercede or limit the Refuse Act. However, the Corps of Engineers, charged with administration of the Act, failed to accept the broader duty to control all pollution of navigable waters and acted only on navigation-impeding discharges. Since the restrictive interpretation given the Act by the Corps was not clearly erroneous, reliance on the administrative construction of the statute presented a viable defense. In the instant case, PICCO asserted that they had relied on the Corps' interpretation of the statute. The government contended that judicial precedent and recent publicity provided notice of the correct construction. The Supreme Court found that exclusion of reliance evidence was error. The Court thus opened the door to judicial battles over this defense, and substantially undercut the recently acquired strength of the Refuse Act. (Moorhouse-Florida)

Group 5G-Water Quality Control

EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR NEW SOURCES FOR THE SIANDARDS FOR NEW SOURCES FOR THE BLEACHED KRAFT, GROUNDWOOD, SULFITE, SODA, DEINK AND NON-IN-TEGRATED PAPER MILLS SEGMENT OF THE PULP, PAPER, AND PAPERBOARD POINT SOURCE CATEGORY.

Environmental Protection Agency, Washington,

Federal Register, Vol 40, No 173, p 41300-25, September 5, 1975, 75 tab.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Sulfite liquors, *Wood wastes, wastes, "Sulfite liquors, "Wood wastes, "Chemical wastes, "Federal Water Pollution Control Act, Administrative decisions, Administrative trol Act, Administrative decisions, Administrative agencies, Regulation, Effluents, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control. Identifiers: *Federal Water Pollution Control Act(FWPCA) Amendments of 1972.

Pursuant to the authority of the Federal Water Pol-lution Control Act (FWPCA), the Environmental Protection Agency (EPA) hereby gives advance notice of intent to promulgate effluent limitation guidelines for existing sources and standards of performance and pretreatment for new sources in the bleached kraft, groundwood, sulfite, soda, the bleached kraft, groundwood, sulfite, soda, deink and non-integrated paper mills segment of the pulp, paper and paperboard point source category. The proposed regulations divide the point source category into 11 distinct subcategories: dissolving kraft, market kraft, BCT kraft, fine kraft, papergrade sulfite, dissolving sulfite, GW-chemi-mechanical, GW-thermo-mechanical, GW-CMN papers, GW-fine papers, soda, deink, NI fine papers, NI tissue papers and NI tissue FWP. For each subcategory limitations are set representing the reduction attainable through use of best available technology and through use of best available technology economically achieva-ble. Where applicable, guidelines for use of wet woodyard operations are separately stated. Each sub-category also contains pretreatment and performance standards for new sources. (Comer-Florida) W77-08383

OIL SPILLS AND SPILLS OF HAZARDOUS

Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
Oil and Special Materials Control Division, March 1975. 29 p, 32 ref, 57 photo.

Descriptors: *Oil pollution, *Regulation, *Oil spills, Hazards, Disasters, Water pollution sources, Oil, Oil industry, Oil wastes, Legal aspects, Environmental effects, Water law, Remote sensing, Penalties(Legal). Law enforcement, Planning, Oily water, Cleaning. Identifiers: *Hazardous substances(Pollution), *Administrative regulations.

The primary objective of the Environmental Protection Agency's (EPA) oil and hazardous sub-stance spill program is to protect water quality through the prevention of spills. Various measures have been taken by the EPA to prevent spills and many been taken by the EPA to prevent spins and minimize their impact on the environment. Recog-nizing that the causes of oil spills are many, the EPA has published oil pollution prevention regula-tions requiring a Spill Prevention and Countermea-sure (SPCC) Plan. The plan is flexible and func-tions under EPA guidelines. It requires owners and tions under EPA guidelines. It requires owners and operators to prepare oil spill prevention plans, which must be certified by a Professional Engineer. As a guide the EPA has published a list of hazardous polluting substances. Should spills still result, the EPA is prepared to impose civil penalties. The EPA is continuing its investigations into methods for cleaning up spills. Some methods discussed include: Procedures for cleaning up slow-moving water; water soluble hazardous substances; and oily sand. Spill surveillance devices such as modern remote sensing systems are being used to quickly detect oil spills. Several recent spectacular spills are identified and discussed. (Hadoulias-Florida)

AMERICAN FROZEN FOOD V TRAIN ('GUIDELINES' AND 'EFFLUENT LIMITA-TIONS' FOR THE POTATO PROCESS INDUS-TRY PURSUANT TO THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS

For primary bibliographic entry see Field 6E. W77-08386

AMERICAN PETROLEUM INSTITUTE V EN-VIRONMENTAL PROTECTION AGENCY (CHALLENGE TO EPA STANDARDS FOR REFINERIES UNDER THE FWPCA AMEND-

For primary bibliographic entry see Field 6E. W77-08394

OHIO LIQUID DISPOSAL, INC V DAWE (DEFINING 'WATERS OF THE STATE' WITHIN WATER POLLUTION CONTROL STATUTE).

For primary bibliographic entry see Field 6E. W77-08401

CITY OF YORK V. PENNSYLVANIA DEPART-MENT OF ENVIRONMENTAL RESOURCES (DELEGATION OF AUTHORITY UNDER THE PENNSYLVANIA WASTE MANAGEMENT

For primary bibliographic entry see Field 6E. W77-08403

WATER RESOURCES COMMISSION V. CON-NECTICUT SAND AND STONE CORPORATION (JUDICIAL REVIEW OF ADMINISTRATIVE FACTUAL DETERMINATION). For primary bibliographic entry see Field 6E. W77-08404

THE RATIONALE FOR ATTEMPTING TO DEFINE SALT MARSH MOSQUITO-BREEDING AREAS IN GALVESTON COUNTY BY REMOTE SENSING THE ASSOCIATED VEGETATION.

Lockheed Electronics Co., Houston, Tex. For primary bibliographic entry see Field 4A. W77-08428

APPLICATION OF EREP, LANDSAT AND AIR-CRAFT IMAGE DATA TO ENVIRONMENTAL PROBLEMS RELATED TO COAL MINING, Earth Satellite Corp. Washington, D. C. For primary bibliographic entry see Field 5A. W77-08429

REMOTE SENSING APPLICATIONS IN THE INVENTORY AND ANALYSIS OF ENVIRON-MENTAL PROBLEMS,

Environmental Protection Agency, Warrenton, Va. Environmental Photographic Interpretation Center. For primary bibliographic entry see Field 5A.

W77-08438

FOX CHAIN OF LAKES INVESTIGATION AND WATER QUALITY MANAGEMENT PLAN, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 2H.

A STUDY OF COOLING INITIALLY UNIFORM AND THERMALLY STRATIFIED LAYERS OF

Purdue Univ. Lafavette, Ind. School of Mechanical Engineering. M. Behnia.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 123, Price codes: A07 in paper copy, A01 in microfiche. Master of Science Thesis, December 1975. 123 p, 39 fig, 46 ref, 2 append. OWRT A-029-IND(11).

Descriptors: *Water cooling, *Water temperature, *Convection, Thermal conductivityy, *Thermal radiation, *Thermal stratification, Thermal pollution, Model studies, Evaporation, Water pollution. Identifiers: Mach-Zehnder Interferometer.

A laboratory study is described of the cooling of initially uniform and thermally stratified layers of water by convection, evaporation, and radiation. water by convection, evaporation, and radiation.

Temperature measurements were made with a Mach-Zennder interreformeter and the How Heid was visualized by electro-chemical dye. A lake was simulated in a 40 x 25 x 10 cm cell. Thermal stratification was induced by tungsten lamps in parabolic reflectors which produced collimated incident radiation flux. For the uniform temperature cell, water descended by free convection to a depth of 10-25 cm. The cooling rate had a decisive influence on the frequency of the descending par-cels of cooler water. Mixing motion occurred near the surface in the thermally stratified cell. The motion had an initial regular roll pattern, but as cooling continued, the roll pattern in the convective layer deteriorated into motion similar to that observed during cooling of an initially uniform temperature layer of water. A model was developed to predict the dynamics of the convective layer. The numerical solution to the model equation was found to agree better with the experimental data than alternatives based on the closed form analytical solution using a constant average surface heat flux. W77-08444

SELECTIVE WITHDRAWAL AND HEATED WATER DISCHARGE: INFLUENCE ON THE WATER QUALITY OF LAKES AND RESERVOIRS PART I - SELECTIVE WITHDRAWAL, Wisconsin Univ. -Madison. Dept. of Civil and Environmental Engineering.
P. L. Monkmeyer, J. A. Hoopes, J. C. Ho, and G.

R Clark

Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-268 237, Price codes: A05 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, 1977. 69 p., 20 fig. 47 ref. OWRT B-080-WIS(8), 14-31-0001-3550, 14-31-0001-3850.

Hydraulics, Impoundments. Descriptors: Descriptors: Hydraulics, *Impoundments, *Stratified flow, *Withdrawal, *Destratification, *Water quality, *Model studies, *Heated water, Discharge(Water), Lakes, Reservoirs, Hypolim-nion, Forecasting. Identifiers: *Selective withdrawal, Bottom

withdrawal

A variety of methods have been proposed to im-prove the water quality of lakes and reservoirs. This work is directed toward the overall improvement of water quality in a reservoir through the removal of the poor quality, hypolimnetic water. In particular, theoretical and experimental in-vestigations on selective withdrawal of a viscous, non-diffusive, linearly-stratified fluid from the bottom and intermidiate depths of a reservoir have been carried out. The governing differential equa-tions which describe planar and axisymmetric withdrawal are derived. In the case of bottom withdrawal a momentum integral technique that retains inertial effects is employed. This is in contrast to the intermediate axisymmetric withdrawal case, where a non-inertial similarity approach is used. In each case, theoretical horizontal velocity profiles are obtained together with expressions for the thickness of the layer of hypolimnetic water withdrawn. Expressions are also derived in each case to predict the quality of the water withdrawn. Laboratory experiments are described; the results obtained verify the theoretical predictions reasonably well. Procedures for predicting the withdrawal layer thickness and discharged water quality in an actual reservoir are discussed. W77-08447

RECLAMATION AND USE OF DISTURBED LAND IN THE SOUTHWEST. University of Arizona Press, Tucson, Thames, J.L., ed., 1977. 63 fig, 42 tab, 654 p. \$8.50.

Descriptors: *Reclamation, *Environmental effects, *Irrigation systems, *Mine wastes, *Strip mine wastes, *Southwest US, Mining, Irrigation, Water resources, Land use, Sprinkler irrigation, Irrigation efficiency, Hydrology, Wastes, Water pollution sources, Strip mines.
Identifiers: Trickle irrigation, Drip irrigation.

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This volume is the result of a symposium on reclamation and land use in the Southwest, held January 1975 at the University of Arizona, Tucson. Its ry 1975 at the University of Arizona, Tucson. Its purpose is to contribute to an understanding of the constraints, alternatives and techniques in the reclamation of lands disturbed by mining and to present the latest results of major research efforts. The 33 articles by several authors are concerned with various facets of reclamation, including the advantages and disadvantages of the sprinkler system and drip or trickle irrigation as an effective way to facilitate revegetation of problem areas. Also discussed is use of water by the mining industry and the effects on the environment. [Amailtry and the effects on the environment. (Jamail-Arizona) W77-08452

WATER QUALITY IN THE TEXAS COASTAL

Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research

For primary bibliographic entry see Field 5B. W77-08465

RESPONSE OF OAT AND SPINACH TO SEWAGE SLUDGE APPLICATION IN SOIL, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 5C.
W77-08495

DESIGN OF A WATER QUALITY MONITOR-ING NETWORK, North Carolina Univ. at Chapel Hill. Dept. of En-vironmental Sciences and Engineering. For primary bibliographic entry see Field 5A. W77-08497

PREDICTION MODELS OF REAERATION RATE FOR MOUNTAIN CREEKS, Utah State Univ. Dept. of Civil and Environmental

Utan State Univ. Dept. of Civil and Environmental Engineering.
K. D. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 581, Price codes: A08 in paper copy, A01 in microfiche.
M. S. Thesis, 1975. 138 p, 5 fig, 5 tab, 2 append.
OWRT B-095-UTAH(2). 14-31-0001-4132.

Descriptors: Dispersion, Dissolved oxygen, *Mathematical models, Mixing, *Reaeration, Tur-bulence, *Utah, Model studies, Water pollution sources, Path of pollutants. Identifiers: *Summit Creek(Utah),

Creek(Utah), *Mountain Smithfield(Utah), Reoxygenation,

Reaeration process studies were conducted on a mountain creek and a large laboratory flume. The

method of evaluating the dispersion coefficient, mean velocity, and reaeration coefficient for both creek and flume consisted of finding these values for a deoxygenated portion of the flow containing a conservative tracer (dye). The deoxygenated slug is measured as it moves downstream and the slug is measured as it moves downstream and the three values are best fit in the analytical solution of the longitudinal dispersion equation which dynamically describes the flow of the dispersing slug in the stream. The best fit was acomplished by using the method of least squares in which the sum of squares of the differences between and dissolved oxygen and dye concentrations calculated from the dispersion and dye concentrations calculated from the dispersion equation and those obtained from the dispersion equation and those obtained from the actual measurements is minimized. A reaeration coefficient prediction model of general form was developed. The model is composed of two dimensionless parameters which were determined from the dissolved-oxygen balance equation. The model parameters were evaluated specifically for the mountain creek and laboratory distributed to the control of the contro flume. A comparison of this model with existing models revealed that most existing models are incomplete in form. Inclusion of the dispersion coefficient in the reaeration coefficient model improved the prediction accuracy.

W77-08501

IN MHI'S INTEGRATED TECHNIQUES FOR ENVIRONMENTAL PRO-TECTION

Mitsubishi Heavy-Industries Ltd., Tokyo (Japan). Environmental Technology Dept. For primary bibliographic entry see Field 5D. W77-08533

DESIGN AND OPERATION OF RAIN RETEN-TION BASINS (ENTWURF UND BETRIEB VON REGENRUCKHALTEBECKEN), For primary bibliographic entry see Field 8A. W77-08547

AERATORS CONTROL LIFT STATION ODOR

AND CORROSION, Mullins (W. H.), Inc., San Antonio, Tex. W. H. Mullins.

Water and Sewage Works, Vol. 124, No. 3, p 75, March, 1977.

Descriptors: *Aeration, Wells, *Odor, *Corrosion control, Sewage treatment, Organic matter, Solid wastes, Hydrogen sulfide, Performance, Color, Dissolved oxygen, Biochemical oxygen demand, Trickling filters, Treatment facilities, Equipment, Effluents, Waste water treatment. Identifiers: Lift stations, Wet wells.

A preaeration process for the control of odor and corrosion at lift stations was described. Aerators with self-priming centrifugal pumps mix atmospheric oxygen with raw sewage to reduce organic solids to macroscopic size, to free solids from embedded and clinging gas particles, and to float suspended grease. Approximately 1,100 gal-lons of raw sewage can be circulated per minute. Recirculation from the wet well back to the first upstream manhole eliminates the release of hydrogen sulfide from raw sewage into the wet well. Upstream recirculation carries a raw sewage DO that varies from 4 to 6 milligrams/liter. Raw sewage color is changed from black to a foamy light tan. In addition to controlling odor and corro-sion, this system also caused only grease to float sion, this system also caused only grease to float on the surface of the primary clarifier; its effluent was relatively clear. The primary clarifier consistently removed 90-95% of settleable solids and 65-70% of BOD. The high degree of grease removal benefits the trickling filter secondary system of the treatment plant. BOD reduction between raw sewage at the lift station and at the plant varied from 10 to 20% depending on the time of day samples were taken. (Collins-FIRL.) W77-08567 OIL-FLUSHED TOILETS GAIN, For primary bibliographic entry see Field 3D. W77-08583

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

IMPLEMENTATION OF AN OPTIMIZATION MODEL FOR OPERATION OF A METROPOLITAN RESERVOIR SYSTEM, Southern Methodist Univ., Dallas, Tex. School of Engineering and Applied Science. For primary bibliographic entry see Field 4A. W77-08211

WATER AND ENERGY SYSTEMS: A PLANNING MODEL, Illinois Univ., at Urbana-Champaign. Inst. for Environmental Studies. E. D. Brill, Jr., S. G. Velioglu, and R. W. Fuessle.

Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12902, May 1977, p 17-32. 4 fig, 3 tab, 22 ref. OWRT B-092-ILL(3).

Descriptors: *Water resources develment, *Alternative planning, *Optimization, *Economic efficency, *Energy, *Linear progamming, *Water supply, *Watet allocation(Policy), Constraints, supply, "Watet allocation(Policy), Constraints, Evaluation, Demand, Electric power, "Illinois, Poweplants, Equations, Mathematical models, Operations research, "Regional analysis. Identifiers: "Regional planning, Cost minimizaon, Screening model, Sensitivity analysis, Pipeline

gas, Systems engineering.

In regions where energy facilities place major de-mands on the water resources, it is desirable to plan the development of these systems with an understanding of their interrelationships. Described is a mathematical model of these interlocking systems. The major model components are the supply and demand points for water, electrical power, and pipeline gas that is produced from coal. The model allocates water to the various demands and locates energy facilities by subregions. Linear programming is utilized to evalute the model which is designed for preliminary screening purposes. The objective function is to minimize the sum of the site-dependent supply costs of water and the transportation costs for water, coal, electricity, and gas. An application of the model in Illinois demonstrates the utility of sensitivity analysis and parameterization techniques for examin-ing trends and tradeoffs for alternative regional plans. The example also demonstrates the interre-lated nature of the water resources and energy systems and demonstrates the potential impact of a large new coal-conversion industry on water resources. (Bell-Cornell)

WATER ALLOCATION AND PRICING FOR CONTROL OF IRRIGATION-RELATED SALINITY IN A RIVER BASIN, California Univ., Los Angeles. Dept. of Engineering Systems. For primary bibliographic entry see Field 5G. W77-08213

MINIMIZING COSTS IN WELL FIELD DESIGN IN RELATION TO AQUIFER MODELS, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W77-08214

Group 6A-Techniques Of Planning

NETWORK EVALUATION OF WASTEWATER COLLECTION ECONOMICS, Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering. For primary bibliographic entry see Field 5D.

W77-08331

OPTIMAL LAYOUT AND DESIGN OF STORM SEWER SYSTEMS, Illinois Univ. at Urbana-Champaign. Dept. of Civil

Engineering.
For primary bibliographic entry see Field 5D. W77-08334

A SIMULATION OF AN IRRIGATION SCHEDULING MODEL WHICH INCORPORATES RAINFALL PREDICTIONS, Auburn Univ., Ala. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 3F. W77-08343

INPUT-OUTPUT MODELING IN WATER RESOURCES SYSTEM PLANNING, Colorado State Univ. Fort Collins. Dept. of Civil

Engineering.
D. W. Hendricks, and R. W. DeHaan.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 064, Price codes: A06 in paper copy, A01 in microfiche. Environmental Engineering Technical Report No. 3, November 1975. 92 p, 29 fig, 13 tab, 32 ref, 3 append. OWRT B-115 COLO(1), 14-31-001-5060.

Descriptors: *Input-output analysis, *Model studies, Planning, *Economics, *Water supply, *Water demand, *Colorado, Imported water, Agricultural water, Municipal water, *Future planning(Projected).

Identifiers: *South Platte River basin(Colo), *Water resources systems.

Principles of input-output modeling of economic systems are adapted to the description of a water resource system. The major sectors of supply and demand are identified, such as 'native surface water flows,' 'imported water,' 'agriculture,' 'municipal.' These sectors were disaggregated further into specific water transferring entities, such as particular streams, geographical regions of the agricultural sector, specific cities, etc. This resulted in an 81 x 80 matrix, displayed on a magnetic board. From this the distribution of available supplies is seen on the rows from each supply source. How each demand entity satisfies its needs is seen as the sum of the entries for the respective column. From this an entire water resources system is displayed at once. This was done for the year 1970 for the South Platte basin. The model can aid in planning for future years by imposing the future total demands for each water demand entity (as the bottom row entries). From this, alteres for satisfying these demands can be seen. W77-08346

AN ECONOMIC APPRAISAL OF REUSE CON-CEPTS IN REGIONAL WATER SUPPLY Utah State Univ., Logan. Dept. of Economics.

For primary bibliographic entry see Field 5D. W77-08347

MULTIPLE OBJECTIVE PLANNING: SMALL

WATERSHEDS, Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics For primary bibliographic entry see Field 6B. W77-08350

6B. Evaluation Process

CITIZEN PARTICIPATION IN COMPREHEN-SIVE WATER RESOURCES PLANNING, Massachusetts Univ., Amherst. Inst. for Man and

Environment. M. O. Ertel, and S. G. Koch.

M. O. Ertel, and S. G. Koch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 665,
Price codes: A06 in paper copy, A01 in microfiche.
University of Massachusetts Water Resources
Research Center, Publication No. 77, August 1976,
103 p, 1 fig, 5 tables, 48 ref, 3 append. OWRT-B044 Mass (1). 14-31-0001-5082.

Descriptors: *Social Participation, Planning, *Comprehensive Planning, Project planning, Decision-making, River basin development, *River basin commission, *Attitudes, *Social impact, Social values.

Identifiers: *New England River Basins Commission, *Citizen participation, *Public participation.

The research focused on documentation of the impact of citizen participation upon the planning recommendations of three Level B Studies of the New England River Basins Commission and an evaluation of the participatory strategies utilized to secure that participation. The documentation and evaluation were obtained through a detailed examination of Study documents, personal observations and interviews, and survey research. The major conclusion is that a professionally directed and designed program of public participation does play a significant role in the development of comprehensive plans that are responsive to public needs and opinions. Such programs, and certain identified elements in particular, also have a demonstrable effect upon resultant public approval of the planning recommendations. The importance of financial commitment to the direction of public participation programs, both through provision of a staff with responsibility and skills for such direction and of other supporting resources, is further illustrated by a selective review of the public participation programs of all six River Basin Commissions. (Lefferts - Massachusetts). W77-08105

INVENTORY OF COLORADO'S RANGE MOUNTAIN RESERVOIRS, FRONT

Colorado State Univ., Fort Collins. Dept. of Recreation Resources.

R. Aukerman, W. T. Springer, and J. F. Judge. Available from the National Technical Informa-Avanator Iron the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267 669, Price codes: A08 in paper copy, A01 in microfiche. Colorado State University, Environmental Resources Center, Information Series No 23, May 1977. 159 p, 17 fig, 1 tab, 5 ref. OWRT B-132-COLO(2). 14-34-0001-6062.

Descriptors: *Colorado *Reservoirs Recreation, Surveys, Decision making, Planning, Management, *Water demand, *Water utilizza-tion, Land use, Data collections, Water resources development.

Identifiers: *Front Range Mountain Reservoirs(Colo).

This inventory is an in-depth look at the characteristics of one of Colorado's most valuable resources-its front range high mountain water reservoirs. These reservoirs are storage and control points within a complex delivery system of water for agricultural, industrial, and municipal users. However, in more recent years, other water users have placed increasing demands on the water. As recreation, fish and game, pollution control and others have become recognized as highly important uses of the water, decisions on water allocation have become increasingly more complex. Limited water supply in combination with increasing water demands dictate that intelligent decins be made on efficienct multiple use of scarce

water resources. Colorado is presently entrenched in this difficult decision process. It is essential that those who must make and implement these decisions have accurate, readily available information on the water resource which is being considered. Therefore, this inventory has been undertaken to provide a single core of accurate and current reservoir data for decision making, planning and management. It is expected that all levels of government (federal, state and local) with water and land use planning and management responsi-bilities will find these data helpful.

COMPUTERIZED PLANNING SYSTEM FOR NUCLEAR POWER PLANT EVALUATION, Krannert Graduate School of Management, Lafayette, Ind.

R. H. Bonczek, C. W. Holsapple, and A. B. Whinston.

whiliston.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267663, Price codes: A02 in paper copy, A01 in microfiche. (1976). 23 p, 5 fig, 9 ref. OWRT C-7005(6202)(1).

Descriptors: *Decision making, *Data storage and retrieval, *Social aspect, *Adoption of practices, Attitudes, *Indiana, Evaluation, *Planning, Environment, Networks, *Nuclear powerplants. Identifiers: *Data management systems, *Generalized planning system, Socio-technologi-

A computerized system is described for information storage and query processing adapted to com-plex socio-technological issues. The system is referred to as GPLAN (Generalized Planning System) and can accommodate both qualitative (verbal) and quantitative data. The issue illustrated is the construction of a nuclear power plant, and involves interdisciplinary research and planning. The system's outstanding features are the utilization of the twork variety of data base, the selec-tive retrieval of any configuration of data from a particular network structure, automatic execution of any desired application program from a stan-dard or special library of applications, user interface with a data base and applications by sub-mitting English-like, non-procedural queries, and generality which allows tailoring to specific applications and provides a basis for integration of planning and research activities. The system is general and can be used for a wide variety of socio-technological issues which involve complex data relationships. (Wiersma-Purdue) W77-08108

DISCRIMINANT ANALYSIS OF CHARAC-TERISTICS DETERMINING ACCEPTANCE OR REJECTION OF NUCLEAR POWER, Krannert Graduate School of Management,

C. Holsapple, and A. Whinston.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 664, Price codes: A02 in paper copy, A01 in microfiche. (1976). 13 p, 1 fig, 1 tab, 3 ref. OWRT C-7005(6202)(2).

aspects, *Attitudes, Nuclear energy, Decision making, *Indiana, Environment, Model studies. Identifiers: Linear discriminant processing decisions and the control of the co *Discriminant analysis.

This study utilizes the linear discriminant model to analyze demographic and attitudinal data concerning the construction of a nuclear power facility at the Bailly site in northern Indiana. The objective is to ascertain the extent to which various respondent characteristics are useful in distinguishing among respondent attitudes (opposed, in favor, unsure) toward the Bailly project. Examination of reduced space characteristics leads to an in-terpretation of its two dimensions as respondent uncertainty and respondent resistance. The largest

contributor (positive) to uncertainty was a divorced or separated marital status; the greatest contributor (negative) to resistance was home ownership. Both of these respondent characownersmp. Both of these respondent characteristics were significant in the univariate sense. A particularly striking trend was the reliance of the opposed group upon electronic media as the source of most local news, whereas the other two groups tended to rely most heavily on newspapers. W77-08109

THE NATIONAL CONFERENCE ON WATER. For primary bibliographic entry see Field 6E. W77-08131

RECREATIONAL USE OF TEXAS RIVERS-RECOMMENDATIONS FOR ADOPTION OF THE TEXAS PUBLIC RIVERS ACT, For primary bibliographic entry see Field 6E.

UNIVERSITY PUBLIC SERVICE PROGRAMS AS THEY RELATE TO WATER RESOURCES MANAGEMENT IN WISCONSIN,

Wisconsin Univ. Extension, Madison. Inland Lake Demonstration Project. For primary bibliographic entry see Field 6E. W77-08209

WATER AND ENERGY SYSTEMS: A PLANNING MODEL, Illinois Univ., at Urbana-Champaign. Inst. for En-ENERGY SYSTEMS:

vironmental Studies.

For primary bibliographic entry see Field 6A.

IMPROVING INSTITUTIONAL ARRANGE-MENTS FOR WATER DEVELOPMENT IN THE STATE OF WASHINGTON: DEVELOPMENTAL AND ENVIRONMENTAL TRADE-OFFS AND

Washington Univ., Seattle. Inst. of Governmental Research.

For primary bibliographic entry see Field 6E. W77-08284

CLASSIFICATION AND TEST OF PUBLIC PARTICIPATION CONCEPTS APPLIED TO LOCAL RESOURCE PLANNING,

Wisconsin Univ. Madison. Dept. of Landscape

Architecture. W. T. Lamm.

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Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 007, Price codes: A10 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 196 p, 42 refs. OWRT A-055-WIS(2), 14-31-0001-4050.

Descriptors: *Evaluation, *Testing procedures, *Resources, *Decision making, *Regional development, *Social participation, *Wisconsin, Planning.

Identifiers: Dunn(Wisc), Dane County(Wisc), *Public participation.

An analysis of resource problem definition and solution is provided in terms of concepts about how the public participates in expressing and defining environmental and resource problems and influencing the actions taken. These concepts are traced from their philosophical and theoretical bases, through considerations of the planning process, and finally to discussions of several contemporary participation techniques and communi-cation methods. A proposed planning research methodology is described, using the previous discussions as a guide for its rationale and use. In what manner information can be organized and presented, as well as the type of information that is generated by a specific technique, namely, Target Technique, are also demonstrated. W77-08295

RECSAD: A COMPUTER PROGRAM FOR RECREATION PLANNING, Oklahoma State Univ., Stillwater. Dept. of Geog-

raphy.
S. W. Tweedie, and R. D. Hecock.

S. W. 1 weedle, and K. D. Hecock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 913,
Price codes: A04 in paper copy, A01 in microfiche.
Oklahoma Water Resources Research Institute,
Stillwater, (1976). 65 p, 6 ref, append. OWRT B026-OKLA(2), 14-31-0001-3928.

Descriptors: *Recreation demand, Recreation, *Computer programs, *Planning, *Demand, Evaluation, Simulation analysis, Attitudes.

A computer program (RECSAD: RECreation Supply And Demand) has been described which is believed to have some utility for planners. The program is designed to afford users flexibility with respect to availability of data, preferred assumptions about recreationist behavior, and locally relevant planning strategies. Program outputs in-clude measures of available opportunities, peak demand, latent demand, fulfilled demand, usage of facilities with respect to capacity, and others. Outputs may be utilized directly, or they may be used as inputs to descriptive or analytical statistical packages in order to evaluate the recreation system more fully. Successive runs of the program can be used to simulate conditions under postulated changes in temporal or spatial demand conditions or under planned changes to the recreation system. W77-08300

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS: ECONOMIC, LEGAL, AND FINAN-CIAL ASPECTS.

Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. N. S. Grigg, L. H. Botham, L. Rice, W. J. Shoemaker, and L. S. Tucker.

Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-268 042, Price codes: A05 in paper copy, A01 in microfiche. Hydrology Paper 85, February, 1976. 78 p, 5 append. OWRT B-113-COLO(9), 14-31-0001-5059.

Descriptors: *Cost-benefit analysis, *Flood con-Descriptors: "Cost-benefit analysis, "Flood con-trol, "Evaluation, Benefits, Budgeting, Cities, Drainage, Drainage practices, "Drainage pro-grams, "Economic justification, Feasibility, Financial feasibility, Flood plains, "Project benefits, Runoff, "Storm drains, Financing, "Urban drainage. Identifiers: Drainage law.

Techniques for evaluating minor and major Urban Drainage and Flood Control (UDFC) Projects are described. Economic, political, engineering, financial and legal problems must be faced prior to implementation of proper levels of these projects. The measurement of tangible benefits is described while a literature review revealed no direct objective techniques for quantifying intangibles. Some methods for establishing the relative rankings of intangible contributions show promise for improvement of evaluation techniques, however. The legal problem of establishing benefits is described and a copy of recently enacted Colorado legislation is included. Information on the estimation of flood damages and the selection of discount rates is presented. Careful coordination of land use and drainage control measures is stressed. Related recent legislation and regulations are included W77-08345

METHODOLOGY AND DATA FOR ANALYZING QUANTITY, QUALITY AND ECONOMIC ASPECTS OF MINIMUM STREAMFLOWS, AP-

PENDICES, VOLUME 2, Washington Univ., Seattle. Dept. of Economics. For primary bibliographic entry see Field 5G. W77-08349

MULTIPLE OBJECTIVE PLANNING: SMALL

WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
D. Byers, and W. Miller.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-268 043, Price codes: A03 in paper copy, A01 in microfiche. Purdue University Agricultural Experiment Station Bulletin No 84. June 1975, 42 p, 3 fig, 13 tab, 16 ref. OWRT-B-042-IND(6).

Descriptors: *Multiple purpose projects, *Water resources development, *Social aspects, *Small watersheds, Project planning, Social impact, Decision making, Estimated costs, Estimated benefits, Water management(Applied).
Identifiers: *Net national benefits, *Trade-offs,

*Environmental quality.

This study was an exploration into multiple social and study was an exportant into multiple social goal decision making with reference to small watershed resource planning. The empirical model developed is based on the West Boggs Creek Watershed in Martin and Daviess Counties in Indiana. The programming model consists of maximiz-ing a linear objective function for net national benefits, subject to constraints for physical and institutional limits, discrete activities and incompati-ble activities. Environmental quality standards were not determined a priori to the evaluation, rather, each of the constraints was ranged to develop the trade-off between the social objec-tives. Trade-offs between net national benefit and eight environmental components were identified and functional relations developed from the observations of trade-offs ratios. It was found that the environment of the watershed improved considerably befire there was any constraint imposed on national benefits. As soon as the national benefit becomes constrained by environment, all the relationships between the valued and nonvalued objectives are competitive in nature, in-dicating that there is a definite cost to increasing environmental quality. The model provided information on the causes of the objective trade-offs by reference to the activity taking place as the environmental constraints were parameterized. The results indicated the activities and order of installation which would be most beneficial to improv-ing environmental quality. (Wiersma-Purdue) W77-08350

PLANNING CHALLENGES IN THE MANAGE-MENT OF COASTAL ZONE RESOURCES,

Victoria Univ. (British Columbia). Dept. of Geog-

In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; Published by the Commis-sion for the National Water Resources Develop-ment Plan (COPLANARH), Caracas, Venezuela, Vol. 14, 1976. 24 p, 62 ref.

Descriptors: *Coasts, *Planning, *Institutions, *Administrative agencies, Comprehensive planning, Project planning, Governments, Oceans, Fisheries, Water management, Water utilization, Legal aspects, Regulation, Water law, Institutions, Environmental effects, Political aspects, Social aspects, Jurisdiction, Research and development, Environmental control, Costbenefit analysis.

Identifiers: *Coastal zone water resources, *Coastal zone management, Coastal Zone Com-

*Coastal zone management, Coastal Zone Com-

This paper identifies the problems of water management in the coastal zones, and then suggests institutions and methods of planning needed for effective resolution of these problems. The problems include a need for devising methods to equalize the negative and positive effects of externalities, and mechanisms whereby common pro-

Group 6B—Evaluation Process

perty resources are shared equitably. In the past problems arose from conflicts in goals and dupli-cation of efforts due to the division of planning functions among different government levels. Other problems involved a concentration upon a narrow range of alternatives and evaluation of criteria, and failure to account for the impact of policies and programs on other agencies. author suggests formation of a Coastal Zone Commission to undertake planning on a comprehensive region-wide basis, or a river basin planning authority. Techniques of analysis such as systems modeling, benefit cost analysis, and environmen-tal impact analysis should be used. Attention should be given to the peculiar problems of each coastal zone, including division of responsibilities, and the relationships of the water, land, ocean and atmospheric resources. (Hadoulias-Florida) W77-08376

TICKET TO THERMIDOR: A COMMENTARY ON THE PROPOSED CALIFORNIA COASTAL

University of Southern California, Los Angeles. School of Law. R. C. Ellickson.

Southern California Law Review, Vol. 49, No. 4, p. 715-36 (May 1976).

agencies, *Administrative Descriptors: *Comprehensive *California, planning, *Economic efficiency, *Governmental interrela-tions, Political aspects, Conservation, Regional development, Non-structural alternatives, Local governments, Regulation, State governments, Planning, Multi-purpose projects, Legislation, Decision making, Administration, Administrative

Identifiers: *Coastal zone management, Coastal

The California Coastal Zone Conservation Commission, established in 1972 by the voters, was required to produce a coastal plan by December 1, 1975. Rather than making specific land use designations, the Commission proposed several hundred policies and subpolicies of general application, and recommended an administrative structure for carrying them out. The basic theme of this commentary is that the California Legislature should reject the plan. The program to preserve agricultural lands shows that the plan lacks notice of market resource-allocation; the ends sought do not justify massive intervention in private land markets. Solar energy is not necessarily the best solution for energy production. Reliance on ur-banization rather than scattering of development may be negated by lack of urban consumer de-mand for housing. The plan does not specify whether zoning in coastal areas will be a state or local function. The plan's inefficiencies will benefit planners, attorneys and the economic elite, while taxpapers and housing consumers will lose. Perhaps a massive state coastal agency acting as an information clearinghouse would improve efficiency. (Molloy-Florida) W77-08379

DETERMINATION OF WATER-RESOURCES POLICIES IN ARID LANDS.

C. Clay. In: Social Science Research in Dry Lands, Templer, O.W., ed. Frontiers of the Semi-Arid World: An International Symposium, October 14-18, 1974, Lubbock, Texas. International Center for Arid and Semiarid Land Studies (ICASALS) 1976 Publication no 76-6, p 15-24, 12 ref.

Descriptors: *Water policy, *Water resources, *Arid lands, *Environmental effects, *Water resources development, *Inter-basin transfer, Water pollution sources, Governments, Comprehensive planning, Planning, Water reuse, Water transfer. The problem of water resources planning as part of overall policy making is discussed, and the highlights of studies concerning water resources policy in arid lands and recommendations of the National Water Commission are presented. The problem of pollution and environmental damage in both developed and underdeveloped nations is discussed. The possibilities of and problems associated with interbasin transfer of water are evaluated, and water transfer from Canada to the U.S. and possibly even Mexico is presented as an example. The possible alternative sources of water for arid lands, including cloud seeding and desalination, are discussed; recycling of water and reduced use by irrigation are mentioned as other methods of conserving water. In summary, arid lands need to develop comprehensive water plans, and the political, economic, and environmental aspects of interbasin transfer must be studied carefully. (Jamail-Arizona) W77-08453

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

MINIMIZING COSTS IN WELL FIELD DESIGN IN RELATION TO AQUIFER MODELS, Arizona Univ., Tucson, Dept. of Hydrology and Water Resources. For primary bibliographic entry see Field 4B. W77_08214

STATUS OF REVERSE OSMOSIS DESALINA-TION TECHNOLOGY,

Office of Water Research and Technology, Washington, D.C. Membrane Processes Div. For primary bibliographic entry see Field 3A. W77-08225

AN INVESTIGATION OF THE TECHNICAL AND ECONOMIC FEASIBILITY OF USING GEOTHERMAL **TEMPERATURE** SOURCES IN COLORADO, Environmental Services.

Consulting Boulder, Colo. For primary bibliographic entry see Field 4B. W77-08310

NETWORK EVALUATION OF WASTEWATER COLLECTION ECONOMICS, Northwestern Univ., Evanston, Ill. Dept. of Civil

Engineering. For primary bibliographic entry see Field 5D. W77-08331

ECONOMIC IMPACTS OF CONTROLLING WATER QUALITY IN AN IRRIGATED RIVER

Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G. W77-08332

OPTIMAL LAYOUT AND DESIGN OF STORM SEWER SYSTEMS, Illinois Univ. at Urbana-Champaign. Dept. of Civil

Engineering. For primary bibliographic entry see Field 5D. W77-08334

AN ECONOMIC APPRAISAL OF REUSE CON-CEPTS IN REGIONAL WATER SUPPLY PLANNING,
Utah State Univ., Logan. Dept. of Economics.

For primary bibliographic entry see Field 5D. W77-08347

CONSTRUCTION AND MAINTENANCE COSTS OF SEWER SYSTEMS (BAU UND BETRIEB-SKOSTEN VON KANALISATIONSANLAGEN), For primary bibliographic entry see Field 8A. W77-08542

6D. Water Demand

AN ANALYSIS OF AGRICULTURAL WATER REQUIREMENTS IN THE TAR-NEUSE RIVER BASIN OF NORTH CAROLINA. North Carolina State Univ., Raleigh. Dept. of

Biological and Agricultural Engineering. For primary bibliographic entry see Field 3F. W77-08106

INVENTORY OF COLORADO'S RANGE MOUNTAIN RESERVOIRS, FRONT

Colorado State Univ., Fort Collins. Dept. of Recreation Resources. For primary bibliographic entry see Field 6B. W77-08107

THE NATIONAL CONFERENCE ON WATER. For primary bibliographic entry see Field 6E. W77-08131

UNITED STATES V TULARE LAKE CANAL COMPANY (RECLAMATION LAWS CON-CERNING SALE OF LAND IN EXCESS OF 160

For primary bibliographic entry see Field 6E. W77-08151

AGRICULTURAL WATER DEMAND IN WAKE

COUNTY, NORTH CAROLINA, North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering. P. R. McLoud.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267 934, tion bervice, springiaeu, va 22101 as 13-25, 75, 79rice codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 99 p., 44 tab, 37 ref, append. OWRT B-068-NC(3), 14-31-0001-4114.

Descriptors: *Agricultural water, *Water demand, *Water utilization, *Irrigation water, *Water requirements, Irrigation, Computer models, Linear programming, *North Carolina, Computer Forecasting, Future planning(Projected).

Identifiers: *Agricultural water demand, Irrigation policy, *Wake County(NC).

The objective was to develop data concerning crops, soils, climate, irrigation practices, and costs of agriculture in Wake County, North Carolina. These data were used in two computer programs: the first to compute water usage at a specified level of agriculture, and the second to compute by linear programming the optimum level of agricul-ture. Using the results of these computer programs, estimates of current irrigation water usage and predictions of usage by the year 2000 were made. The estimates and predictions were made for low, average, and high yearly rainfall levels of 33.5, 45.0, and 58.0 inches respectively. (Stewart-North Carolina State) W77-08297

RECSAD: A COMPUTER PROGRAM FOR RECREATION PLANNING, Oklahoma State Univ., Stillwater. Dept. of Geog-

raphy. For primary bibliographic entry see Field 6B. W77-08300

INPUT-OUTPUT MODELING IN WATER RESOURCES SYSTEM PLANNING, Colorado State Univ. Fort Collins. Dept. of Civil For primary bibliographic entry see Field 6A. W77-08346

A PRELIMINARY ANALYSIS OF THE ENERGY AND WATER REQUIREMENTS FOR DEVELOPING GEOTHERMAL ENERGY IN

ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 4B.
W77-08351

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TER Civil THE WINTERS DOCTRINE AND HOW IT GREW: FEDERAL RESERVATION OF RIGHTS TO USE OF WATER, Office of the Solicitor (Interior), Washington, D.

For primary bibliographic entry see Field 6E.

WATER FOR FOOD - OR FOR MORE IMPORTANT PURPOSES. (REALLOCATION OF IRRIGATION WATER TO CITIES AND INDUS-Wyoming Univ., Laramie. Coll. of Law. For primary bibliographic entry see Field 6E.

W77-08377

APPROPRIATION OF WATER. For primary bibliographic entry see Field 6E. W77-08405

DIGITAL-MODEL ANALYSIS OF THE EF-FECTS OF WATER-USE ALTERNATIVES ON SPRING DISCHARGES, GOODING AND JEROME COUNTIES, IDAHO, Geological Survey, Boise, Water

Resources Div. For primary bibliographic entry see Field 4B. W77-08484

6E. Water Law and Institutions

CITIZEN PARTICIPATION IN COMPREHEN-SIVE WATER RESOURCES PLANNING, Massachusetts Univ., Amherst. Inst. for Man and Environment.

For primary bibliographic entry see Field 6B. W77-08105

REORGANIZING POLLUTION CONTROL IN

THE U.K. Wessex Water Authority, Bristol (England). For primary bibliographic entry see Field 5G. W77-08111

FEDERAL STATUTORY MODIFICATION OF PRIVATE WATER RIGHTS IN SOUTH

Florida Univ., Gainesville. School of Law.

W. A. Bollinger.

Available from Eastern Water Law Center,
University of Florida, College of Law,
Gainesville, Florida 32611, \$2.35. November 1971,

Descriptors: *Florida, *Water rights, *Federal jurisdiction, *Competing uses, *Federal-state water rights conflicts, Jurisdiction, Regulation, State jurisdiction, Water contracts, Water transfer, Water utilization, Relative rights, Legal aspects, Water law, Water resources, Compensation, National

In June 1970 Congress amended the Flood Control Act of 1948 in a move destined to have a nationwide impact on water allocation. The legislation authorizes \$25 million for the Central and Southern Florida Flood Control District so long as \$5 million is used for water flow needs to the Ever-

glades National Park. The Park receives 16.5 per cent of the district's annual deliveries. This imposes a guaranteed annual minimum water flow to the Park. The history of the South Florida area is important to an understanding of the amendment, therefore the author traces the history and makeup of the geographical region. The legal problems of the amendment are serious, especially the implications of federal control of water rights. Guaranteetions of rederal control of water rights. Guaranteeing the Park a federal water appropriation that differs from that of other non-federal users raises the
'states rights' issue. While federal authority in
water resources development is constitutionally
well founded, the courts may favor an award of compensation to those whose water rights have been affected by federal action. However, South Florida's increasing urbanization and industralization will put a heavy burden on the region's water resources, and the state alone does not have the funds to sustain the dwindling resources. Thus, Florida will have to accept the federal regulation, as well as take its own positive steps toward developing strict controls. (Welch-Florida) W77-08112

WATER RESOURCE POLICIES AND AUTHORITIES, COASTAL ZONE MANAGE-MENT PROGRAM IMPLEMENTATION,

Corps of Engineers, Washington, D.C. Federal Register, Vol 41, No 137, p 29146-49, July

Descriptors: *Coordination, *Governmental inter-relations, *Water management(Applied), *State governments, *Coasts, Coastal plains, Administration, Administrative agencies, Legal aspects, Water law, Planning, Projects, Water zoning, Administrative costs, Coastal marshes, Management,

Project planning, Technology.
Identifiers: *Coastal zone
*Administrative regulations,
Management Act of 1972. management, Coastal Zone

The Department of Defense through the Corps of Engineers has proposed new rules pertaining to the Coastal Zone Management Program. The new regulations provide guidance and procedures for the Corps in assisting state programs in ac-cordance with the 1972 Coastal Zone Management Act. State programs must include both short and long range objectives and focus on seven designates substantive elements. Each coastal state has primary responsibility for its own program. Federal administration of the program is to be handled by the National Oceanic and At-mospheric Administration. The Corps of En-gineers will fully cooperate with the states and provide technical assistance upon request. Furthermore, all Corps projects shall be in conruthermore, an Corps projects snan be in conformance with state programs to the maximuum extent practicable. Corps offices preparing data critical to state planning and management shall assist the states in every way possible and lead offices shall be designated with responsibility for coordination of all Corps Civil Works activities within a particular state coastal zone. In addition, the proposed rules provide for funding of all Corps participation by the federal government subject to certain restrictions. (Moorhouse-Florida) W77-08114

LEADVILLE MINE DRAINAGE TUNNEL ACT OF 1976.

Hearings---Sub Comm on Energy and Water Resources--Comm on Interior and Insular Affairs, U. S. Senate, June 7, 1976, p 1-24.

Descriptors: *Federal Water Pollution Control Act, *Mining, *Mine drainage, *Tunnels, *Colorado, Legislation, Water pollution, Mineral Shafts(Excavations), Underground industry, Shatts(EACATATIONS), Charge structures, Excavation, Administrative agencies, Groundwater, Water management(Applied), Confined water, Mine water, Waste water(Pollution), Impoundments, Impounded waters, Sinks.

In June 1976, the Senate Committee on Interior and Insular Affairs conducted a hearing to consider a bill authorizing investigation, stabilization, and rehabilitation of the Leadville Mine Drainage Tunnel. The tunnel had been constructed during World War Two and the Korean War to facilitate drainage of water out of a mining district in which there were large quantities of strategic metals (lead, copper and zinc). From the completion of the tunnel in 1952 until 1976 there had been no maintenance of the tunnel, and the consequent deterioration of its interior has resulted in an impoundment of water estimated to be more than poundment of water estimated to be more than 8,000,000 gallons. This impoundment in turn has created a hazard to the community in the form of sink holes throughout the surrounding area. The proposed bill would authorize rehabilitation of the tunnel and construction and maintenance of facilities to treat the water to be drained in accordance with the Federal Water Pollution Control Act (FWPCA). Statements presented at the hearing in-clude those of an official of the Colorado Department of Natural Resources; Chief Mining En-gineer of the Bureau of Mines; and Assistant Com-missioner of the Bureau of Reclamation. (Sloan-Florida) W77-08115

OPERATION AND IMPACT OF NPDES IN RE-

GION II, PART I, Environmental Protection Agency, New York. Caribbean Construction Grants Branch. For primary bibliographic entry see Field 5G. W77-08117

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 REACH POLLUT-ING ACTIVITIES OCCURRING ABOVE MEAN-HIGH WATER LINE (COMMENT ON U. S. V. HOLLAND).

For primary bibliographic entry see Field 5G. W77-08118

STATES NEED FREEDOM TO INNOVATE (COMMENT ON PL 92-500).
Kansas Dept. of Health and Environment,

Topeka.

Water and Sewage Works, Vol 122, No 1, p cover, 4 (Jan 1975)

Descriptors: *Water treatment, *Flexibility, *Federal-state water rights conflicts, *Water pollution control, *Governmental interrelations, Federal government, Local governments, Political aspects, Administration, Planning, Standards, Financing, Monitoring, Legislation, Law enforce-

Identifiers: Federal Water Pollution Control Act Amendments of 1972, Organizational methods.

The Federal Water Pollution Control Act of 1972 (FWPCA) spelled out a partnership role between the federal and state governments that is a little more 'participating' than states would like. Although states have the primary role in pollution control, they are given detailed instructions, and strait-jacketed as they try to adapt to particular situations in their local areas. More progress could be made if the states were to be considered laborabe made if the states were to be considered labora-tories for innovative treatment methods and as workshops on administrative and organizational methods. If such a plan were adopted, a failure would be on a small scale and not a huge national disaster. A better way to approach the problem then, would be to set national but flexible stan-dards, and provide funds and facilities for research and development. Plans and scientific changes should be the state's responsibility where it can be done more efficiently than under a rigid system of national controls. Monitoring effluents can also be handled better locally. Despite being can also be handled better locally. Despite being hampered by a new plan, a new regulatory agency, and a complex law, the federal government appears to be moving toward this view. (Rieck-W77_08119

Group 6E-Water Law and Institutions

U.S. ENVIRONMENTAL PROTECTION AGEN-CY ENVIRONMENTAL RESEARCH OUTLOOK FY 1976 THROUGH 1980 (REPORT TO CON-GRESS).

Environmental Protection Agency, Washington, D.C. Office of Research and Development. For primary bibliographic entry see Field 6G. W77-08120

TOWARD CLEANER WATER IN THE PACIFIC NORTHWEST AND ALASKA-THE NATIONAL WATER PERMIT PROGRAM.

Environmental Protection Agency, Seattle, Wash. Public Affairs Office. For primary bibliographic entry see Field 5G. W77-0812

FEDERAL CONTROL OVER WETLAND AREAS: TFE CORPS OF ENGINEERS EX-PANDS ITS JURISDICTION, For primary bibliographic entry see Field 5G. W77-08123

GOVERNMENTAL INTEREST IN PROTECTING BEACH FROM ENVIRONMENTAL DAMAGE THROUGH OVERUSE OUTWEIGHS DUE PROCESS RIGHT TO BATH NUDE, I K Voe?

The Georgetown Law Journal, Vol 64, p 1171-85 (May 1976). 88 ref.

Descriptors: *Beaches, Ecology, *Recreation, *Massachusetts, *National parks, Social aspects, Judicial decisions, Constitutional law, Litter, Waste disposal, Legal aspects, Water law, Public access, Regulation, Seashores, Shores, Dunes, Environmental control, Social change, Social values, Recreation demand. Identifiers: *Administrative regulations.

In William V. Hathaway the First Circuit Court of Appeals acknowledged that the constitutional right of personal liberty protected by the fifth amendment due process clause encompassed the right to bathe nude. The right, so based, is not a fundamental right and was limited to traditional nude beaches. The defendant National Park Service had sought to prohibit nude bathing on the beach in question in order to reduce litter and environmental damage caused by the beach's increasing popularity. The court concluded that the governmental interest in protecting the beach environment was sufficient to outweigh the bather's narrow right. The court did not apply the the rational basis test traditionally used in examination of non-fundamental rights although the same result would have been obtained. Rather, the court adopted a balancing approach weighing the rights and interests of the parties and subordinating the legislative judge-ment. Such scrutiny of the means might well result in undue judicial interference. The author suggests the equally practicable alternative means test as a more desirable approach to determining the relative rights or parties in such disputes. (Moorhouse-Florida) W77-08124

OIL AND WATER-A NEW LOOK AT THE UNIFORMITY DOCTRINE,

F. W. Lewis. Baylor Law Review, Vol 26, No 2, p 194-210 (Spring 1974). 68 ref.

Descriptors: State governments, Federal governments, *Oil spills, *Federal jurisdiction, *State jurisdiction, *State jurisdiction, Constitutional law, Common law, Legal aspects, Political aspects, Judicial decisions, Legal review, Water law, International law, Foreign trade, International waters, Law of the sea, Oil pollution, Water pollution sources, Oil wastes, Foreign countries, Coasts, Shores, Legislation. Identifiers: *Coastal waters, *Territorial seas(Jurisdiction), *Uniformity doctrine, *Admirality and maritime jurisdiction, Freedom of the seas, Federal judicial power, States' rights.

A serious problem facing the coastal states is the potential damage from oil spills by vessels or offshore facilities. The ability of states to legislate in order to protect themselves from such dangers seems limited. Article III, section 2 of the United States Constitution extends the federal judicial power to, ...'all cases of admirality and maritime jurisdiction.' Hence, the uniformity doctrine has existed as the main barrier to state action. Early cases showed the basis for the doctrine as the need for uniformity in (1) domestic or internal affairs, and (2) international law and foreign affairs. As to domestic affairs, courts will employ a balancing test, and view protection of a state's coastal region from the effects of oil pollution as highly compelling. Hence, a state law directed at domestic action will often be upheld. On the other hand, courts have been reluctant to subordinate the need for uniformity in international law and foreign relations to any state policy or interest. Given the possibility that the act of a state would be attributed to the nation as a whole, and would therefore justify reciprocal action by other nations, state legislation cannot predominate over federal with regard to foreign vessels. State legislation, however, remains effective against domestic vessels, and in all state waters which are not navigable waters of the U.S. (Moorhouse-Florida) W77-08125

LET'S HAVE ACHIEVABLE 'SAFE' DRINKING WATER.

Illinois State Environmental Protection Agency, Springfield. Div. of Public Water Supplies. For primary bibliographic entry see Field 5G. W77-08127

PL 92-500: PHOENIX V. THE EPA, Arizona State Water and Sewer Dept., Phoenix. For primary bibliographic entry see Field 5G. W77-08128

CAN A STATE EMBARGO THE EXPORT OF WATER BY TRANSBASIN DIVERSIONS, Washington Univ., Seattle. School of Law.

C. E. Corker.
Idaho Law Review, Vol 12, No 2, p 135-52 (1976).

Descriptors: *Inter-basin transfer, *Governmental interrelations, *Interstate rivers, *Interstate compacts, *Equitable apportionment, *Prior appropriation, Colorado River, Columbia River, Interstate commissions, River basin commissions, Colorado River Compact, Governments, State governments, Water law, Rivers, *Diversion, Relative rights, Federal government, Interstate, Legislation, Regulation, California, Arizona Idaho, Colorado River Basin, Constitutional law. Identifiers: Boulder Canyon Project, Central Arizona Project, California Limitation Act, Commerce Clause, Congressional powers.

Two propositions support the view that a state cannot embargo the export of its water: (1) Congress can effectively authorize the diversion of any water supply in the United States, and (2) in the absence of an Act of Congress to the contrary, states can generally prohibit future projects diverting water from natural sources. The Supreme Court decision in Arizona v. California established the primacy of Congress in this area. The Court left the choice of proration, priority, or some other formula of allocation to the Secretary of Interior subject to modification of that discretion by an act of Congress. Congress later eliminated any doubts that the decision applied only to navigable groundwater. Furthermore, Congressional superiority with respect to any interstate river systems is squarely based on the Commerce Clause of the Constitution. The second proposition concerning powers exercisable by a state assumes the state has not induced other states to rely on exported water. Then, state legislation limiting or forbidding export by future diversion, not discriminatory in favor of intra-state exports, and clearly related to

legitimate state purpose would survive Commerce Clause scrutiny. (Moorhouse-Florida) W77-08129

AMERICAN SEDIMENTATION LAW AND PHYSICAL PROCESSES,

C. E. Busby. Reprinted from Chapter VII, ASCE Manuals and Reports on Engineering Practice--No 54, Sedimentation Engineering, 1975, p 629-74. 8 fig.

Descriptors: *Sedimentation, *Deposition(Sediments), *Sediment distribution, *Sedimentation rates, *Legal aspects, Aggradation, Accretion(Legal aspects), Avulsion, Sediment transport, Fluvial sediments, Marine geology, Running waters, Common law, Reasonable use, Riparian rights, Riparian land, Surface waters, Erosion, Salinity.

The process of sedimentation includes weathering, erosion, transportation, deposition and consolida-tion and often involves legal problems. Of great significance is the issue of who controls the right to sediments suspended in flowing waters. The question assumes particular importance when one realizes such sediments are valuable as mineral and organic fertilizer. Another difficult problem concerns the determination of legal damage caused by sediments when natural flow rates are upset by artificial flow rates induced by man. A precise determination of how much damage is due to sedimentation and how much is due to other causes becomes impossible. The law of sedimenta-tion is derived from two legal sources—the civil and common law. Both sources stress uniformity and stability, but often overlook apparent scien-tific fact. The engineering and the legal professions could benefit by developing and applying basic scientific data within the broad framework of legal administrative processes and standards of fair play. Definitions of water supplies, sedimentation, saline processes, and theories of property ownership and use should be promptly brought within the realm of current scientific reality. (Moorhouse-Florida) W77-08130

THE NATIONAL CONFERENCE ON WATER. Reclamation Era, Vol 61, No 2, p 1-4, 14-18 (1975). 8 p, 4 photo.

Descriptors: *Conferences, *Water resources development, *Water allocation(Policy), *Water users, *Water utilization, Water values, Water law, Water control, Water policy, Water management(Applied), Water costs, Water demand, Water conservation, Federal government, State governments, Governmental interrelations, Water quality, Water rights.

The National Conference on Water, a gathering of experts sponsored by the Water Resources Council, had two primary goals: (1) to examine the role of water in national affairs through 1985; and (2) to consider the adequacy of existing and proposed programs. The conference discussed the wide variety of national objectives concerning the uses of water and how they are in completion, yet need not be incompatible. The conference suggested that the most significant changes in existing water law must come from the states because the greatest amount of water law is state property law. Legislative suggestions for determining water use priorities were presented. The conference examined the trend toward urban population concentration and the resulting water program emphasis. While an urban water policy is certainly encouraged, participants urged that there must also be examination of present and future needs for food, fiber and energy production. Summaries of two of the eight panel sessions were included: Water Laws, Water Rights, and Institutional Arangements. The Role of Federal, State, and Local Governments. The Experts all agreed that the nation can no longer be complacent about its most basic natural resource. (Welch-Florida)

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d Are naBOUNDARIES OF THE COASTAL ZONE: A SURVEY OF STATE LAWS, Louisiana State Univ., Baton Rouge. Sea Grant

Louisian State Villey, particular Legal Program.

J. M. Robbins, and M. J. Hershaw.

Coastal Zone Management Journal, Vol 1, No 3, p
305-331 (1974). 27 p, 83 ref, 2 append.

Descriptors: *Coasts, *Shore protection, *Submerged Lands Act, *Boundaries(Property), Federal government, State governments, Governmental interrelations, Shores, Legislation, Tidal waters, Political aspects, Jurisdiction, Roads, Highways, Vegetation, Elevation, Topography, Tides, Tidal effects, Water level fluctuations. Identifiers: *Coastal Zone Management Act of 1972, *Coastal zone management, Coastal management statutes, Wetlands statutes, Shorelands statutes, Inland boundaries, Seaward boundaries, Boundary delineation.

The Federal Coastal Zone Management Act provides monetary grants to coastal states developing coastal zone management programs. The Act requires each state program to identify the boundaries of the coastal zone subject to management program. Three aspects of the coastal zone must be clearly identified: (1) a seaward limitation; (2) coastal formations or physical features present in the coastal zone; and (3) inland boundaries. Seaward boundaries are generally prescribed by the Submerged Lands Act. Coastal features and inland boundaries for 24 states are analyzed under three types of statutes: (1) coastal management inland boundaries for 24 states are analyzed under three types of statutes: (1) coastal management statutes (Alabama, California, Delaware, Florida, Louisiana, Mississippi, New Jersey, Oregon, Rhode Island, and Texas); (2) wetlands statutes (Connecticut, Georgia, Hawaii, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Rhode Island, Virginia, and Washington); and (3) shorelands statutes (Hawaii, Maine, Michigan, Minnesota, Washington, and Wisconsin). Boundary delineation is made according to various factors including linear measurements. political boundaries roads linear measurements, political boundaries, roads and highways, vegetation, elevation, and tidal flow. An appendix and chart are provided containing state provisions relating to boundary-delineation techniques. (Caudill-Florida) W77-08132

ENVIRONMENTAL PROTECTION THROUGH

THE COMMON LAW, Calgary Univ. (Alberta). Faculty of Environmental Design.

For primary bibliographic entry see Field 6G. W77-08133

RECREATIONAL USE OF TEXAS RIVERS--RECOMMENDATIONS FOR ADOPTION OF THE TEXAS PUBLIC RIVERS ACT,

St. Biggs. St. Mary's Law Journal, Vol. 7, No. 3, p. 575-93

Descriptors: *Rivers, *River beds, *Texas, *Public access, Easements, Trespass, Bodies of water, Water law, Legal aspects, Judicial decisions, Rio Grande River, Banks, Inland waterways, Streams, Streambeds, Navigable rivers, Fishing, Recreation, Camping, Campsites, Lakes, Riparian rights, Eminent domain, Public rights, Water rights, Boundary disputes, State governments, Legislation. Identifiers: *Texas Public Rivers Act, Texas Open Beaches Act, Litter.

Texas is plagued by conflict over the respective rights of riparian landowners and recreationists in its over 80,000 miles of inland waterways. The Texas Public Rivers Act of 1973, a proposed codification of Texas water law, was never re-ported out of committee, but it did present viable

solutions to the conflict between recreationists and landowners. The Act would prohibit the erection of obstructions which might impede travel along a navigable river except where fencing was reasonably necessary to contain livestock.
Administrative criteria for reasonableness would
include a determination of low and high-water
levels and the use of the riparian land. Furthermore, the Act would allow a reasonable use of river banks as an incident of recreational navigation thus resolving the conflict between common law's mean high water line boundaries and civil law's public servitudes on all river banks and permitting land passage around obstructions in the river. Camping and picnicing would still be limited to lands below the mean high water mark. The to lands below the mean high water mark. The problem of extremely limited access to public waters is partially resolved by a provision authorizing acquisition of private lands. However, as this would prove financially prohibitive, development of existing public lands is recommended. (Moorhouse-Florida) W77-08134

SNAKE RIVER LAND CO V STATE BOARD OF CONTROL (BENEFICIAL USE OF WATER HELD SUFFICIENT PROOF OF APPROPRIA-

560 P.2d 733-39 (Wyo Sup Ct 1977).

Descriptors: *Wyoming, *Appropriation, *Administrative agencies, *Beneficial use, *Water permits, Irrigated land, Permits, Local governments, fingated land, refinits, Local governments, fudicial decisions, Water policy, Water law, Diversion, Water rights, Water resources, Water utilization, Water allocation(POlicy), Water use, Water conservation.

Land company appealed the judgment of the district court which affirmed the decision of an administrative board denying the company's petition to cancel a permit allowing diversion and appropriation of certain state water. Appellant based its appeal on the fact that appellees failed to file a notice of beneficial use as required by statute. Ap-pellant contended that this made the permit invalid. The state supreme court found that although current state law requires such a filing within five years after a specified date, that at the time this permit was issued there was no time limit for submitting proof of appropriation. The court further found that the statute relied upon by the appellant provides a notice procedure which must be com-plied with before forfeiture can occur. No such procedure had been initiated by the state. Accordingly, since there was substantial evidence that the water had been put to beneficial use for reduced acreage since the issuance of the original permit, the judgment was affirmed. (Petruff-Florida) W77-08135

PONCE DE LEON CONDOMINIUMS V DIGIROLAMO (DEVELOPER RESPONSIBLE FOR CONTROL OF SURFACE RUNOFF). 232 S.E.2d 62-67 (Ga. Sup Ct 1977).

*Runoff. *Discharge(Water), "Drainage systems, "Surface runoff, "Georgia, Surface waters, Ponding, Silts, Drainage, Routing, Legal aspects, Water law, Sedimentation, Silting, Judicial decisions, Water control, Water injury, Surface drainage, Damages.

Identifiers: "Liability, "Property interests.

Plaintiff landowner brought suit against defendant developer claiming that the development of condominums adjacent to the plaintiff's property caused the property to receive unnaturally large quantities of surface water. The lower court awarded damages, injunctive relief, and attorneys fees to the plaintiff. The defendant developer appealed. The record showed that at the inception of the project the plaintiff complained to the defendant that the development would result in increased discharge of surface water onto his pro-

perty. Defendant took no action at that time. The plaintiff then experienced a runoff problem which resulted in the pooling of water and silt on the plaintiff's property. Plaintiff again complained and defendants partially remedied the problem by installing sedimentation ponds. The injury had found that the defendant acted with conscious indifference in his failure to remedy the situation entirely by recogning the decines system. The state tirely by rerouting the drainage system. The state supreme court found no error of law, and held that the evidence supported the verdict. (Petruff-

FARMERS INVESTMENT COMPANY V BETT-WY (DOCTRINE OF REASONABLE USE AS AP-PLIED TO GROUNDWATERS). 558 P.2d 14-27 (Ariz 1976).

Descriptors: *Arizona. *Groundwater resources. Descriptors: "Arizona, "Groundwater resources, *Reasonable use, "Competing uses, Water supply, Water table, Water wells, Groundwater basins, Subsurface waters, Farms, Irrigation, Percolating water, Common law, Legal aspects, Water law, Mining, Municipal water. Identifiers: "Groundwater management.

The incorporated owner of farm lands in the Sahuarita-Continental Critical Groundwater Area filed suit against mining companies to enjoin them
(1) from taking waters beneath the critical area and
using them on lands other than where they were using them on anno other than where they were taken; and (2) from completing the drilling of a deeper well that would deplete the water supply. The City of Tucson, which obtained much of its municipal water from wells downstream from the nunicipal water from weins downstream from the lands owned by the parties, intervened in the suit to enjoin both parties from returning water to the groundwater system that was so changed in quality as to render the domestic supply undesirable. The Superior Court denied plaintiff's and City's appli-cation for injunction and enjoined City from increasing the amount of water it pumped and transported away from the subdivision. Upon appeal by the City and the plaintiff, the Supreme Court upheld the injunction against the City and granted upheld the injunction against the City and granted an injunction against the mining companies, holding that the doctrine of reasonable use does not permit percolating waters to be used off the lands from which they are pumped if others whose lands overlie the common supply are injured or damaged thereby. (Jones-Florida)
W77-08137

MC CARDEL V SMOLEN (THE RIGHTS OF RIPARIAN AND NONRIPARIAN OWNERS TO RECREATIONAL USE OF NAVIGABLE IN-

LAND LAKES). 250 N.W.2d 496-502 (Mich 1977).

Descriptors: *Michigan, *Riparian rights, *Lake shores, *Public access, Boat launching, Ramps, Boating, Legal aspects, Public rights, Access routes, Recreation, Recreation demand, Lakes, Navigable waters, Inland waterways, Judicial decisions.

Identifiers: *Non-riparian owners, *Exclusive rights, *Ownership, Servitude, Navigational servitude, Incidental rights.

An action was brought to determine the ownership of riparian rights in a strip of land, which was designated on a 1911 plat as a 'boulevard' and was designated on a 1911 plat as a 'boulevard' and was dedicated to the county essentially as a public street, but which was actually only undeveloped beach property. The Michigan court defined plaintiffs lakefront landowners' riparian rights, as well as the rights of defendants, non-lakefront landowners. The court held that the plaintiffs owned the riparian rights in the boulevard frontage and, that as a result of their riparian rights, plaintiffs had exclusive right to erect or maintain docks and boat hoists along the shore. However, plaintiffs could not prevent defendants from lounging or picnicking on the boulevard so long as defendants did not unreasonably interfere with the private and

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public rights of plaintiffs. The reason for the ruling is that although plaintiffs are riparian owners of the shore of the navigable inland lake and, as such, own the bottom of the lake to its center, their title is subordinate to the public's navigation rights so long as the public has a lawful means of access to the lake. Incidental to the public's navigational servitude is the right to boat, fish and swim. Therefore, the public boulevard along the lake, provided defendants with access to the lake which in turn conferred accompanying recreational privileges on them. (Denker-Florida)

STATE V. MATZEN (USE OF HISTORICAL MAPS TO SETTLE CLAIMS TO ACCRETION LANDS).

250 NW2d 232-34 (Neb. 1977).

Descriptors: *Nebraska, *Accretion(Legal aspects), *Land forming, *Surveys, Real property, Boundary disputes, Maps, Geologic investigations, Geologic mapping, Judicial decisions, Geological surveys, Missouri River, Rivers, Legal aspects, Movement.

Identifiers: *Quiet title, *Title extinguishment, Ownership, *Property disputes, Expert witnesses.

Plaintiff state of Nebraska brought action to quiet title to accretion land along the Missuouri River. Defendant landowners claimed that the land in dispute accreted to an island tract owned by them and therefore title to accretion land should rest with them. Plaintiff contended that defendant's land was obliterated during the westward movement of the river, and that the effect of such movement was to destroy title to the land. Plaintiff's theory is that when the river moved back astward, accretion land formed along the west bank, and that this land is the property of the state. An 1857 General Land Office map, and 1879 Army Corps of Engineers map, an 1884 Atlas map and an 1894 county surveyor's map showed the gradual development of the accreted land in question. Expert geological witnesses were called to interpret the maps. The experts concluded that the accretion land formed as the river moved east was accretion to defendant's land and not to plaintiffs state's tract. The lower court quieted title in defendants and the judgment was affirmed on appeal to the Nebraska Supreme Court. (Denker-Florida) W77-08139

SALE OF WATER RIGHTS,

Idaho Code Ann secs 42-2601 thru -2608 (Supp 1976).

Descriptors: *Idaho, *Irrigation permits, *Water works, *Water permits, *Water contracts, Water management(Applied), Water rates, Water costs, Water transfer, Water delivery, Water distribution(Applied), Permits, Appropriation, Irrigation, Irrigation programs, Water rights, Water policy.

All owners of irrigation works or reservoirs, dams, canals, or other structures used for conserving or urmishing water for irrigation purposes in the state of Idaho shall petition the department of reclamation for a certificate to sell any water rights in such works. The petition must include a map and other information from which the department can determine the location of the works, the lands to be reclaimed, plans regarding any intended construction, capacity of the works, the number of acres which may be irrigated, names of parties, and terms of the proposed sale. After making necessary on-site inspections, the department shall evaluate the petition and finally issue a certificate to owners of the works. The certificate, which must be filed with the county records, shall indicate the number of water rights which may be sold, the number of acres which may be irrigated, and the form of the contract or deed to be issued to the purchaser. Certificates will not be issued unless the department has considered data and records of stream flow and water supply pertaining to the

water to be sold, covering a period of five years. (Josepher-Florida) W77-08140

DEPARTMENT OF WATER RESOURCES, Idaho Code Ann, secs 42-1701 thru -1738 (Supp

Descriptors: *Resources development, *Idaho, *Water resources development, Water storage, Water supply, Water conservation, Permits, Water policy, Water permits, Water management(Applied), Dam construction, Dam failure, Damsites, Dams, Operation and Maintenance, Reservoir construction, Reservoir operation, Reservoir sites, Reservoir design.

The Idaho legislature herein creates a department of water resources. It is the intent of the legislature to provide for the exclusive state regulation of the construction, maintenance, and operation of all dams and reservoirs within the state. Permits must be obtained by persons desiring to construct or alter dams. Owners of dams must perform tests necessary to enable the state inspector to determine whether conformity with state safety standards is being secured. The department is vested with emergency powers enabling it to assume control over the operation of dams which pose immediate threats to life or property. A water resources board is created to coordinate a program which will achieve conservation, development and optimum use of state water resources. The board is vested with broad contractual powers. Specific criteria to guide the board in the achievement of its statutory goals are delineated. The board must approve all significant reservoir project proposals. Maximum economic development of waters involved, conservation of water, flood control, protection of all vested rights, and the prevention of waste are criteria considered in determining whether the reservoir project shall be carried forward. (Josepher-Florida) W77-08141

WITHDRAWAL OF CERTAIN WATERS FROM APPROPRIATION: SPECIAL MUNICIPAL AND COUNTY WATER RIGHTS,

Ore. Rev. Stat secs 538.010 through .450 (1973).

Descriptors: *Oregon, *Withdrawal, *Diversion, *Columbia River, Legal aspects, Water law, Legislation, Prior appropriation, Recretion, Water utilization, Fish conservation, Fish management, Water rights, Priorities, Condemnation, Parks, Unappropriated water, Streams, Lakes, Municipal water.

Identifiers: *Withdrawn waters, Vested rights.

The diverted waters of Oregon's Ditch Creek, now a part of Willow Creek, are subject to the same rights of appropriation as the original Willow Creek. Morrow County is licensed to divert and store the waters of Ditch Creek and authorized to obtain the property rights necessary to effectuate those rights. The waters of certain other creeks are withdrawn from appropriation or condemnation, except for park purposes, in order to preserve recreational and scenic resources. The waters of Diamond Lake, Lake of the Woods, Hackett, Johnson, Mill, Barr, McNulty, and Milton Creeks, the Rogue River, and the tributaries of the Columbia River are similarly withdrawn in order to protect fish life therein. None of the above withdrawals shall affect vested appropriations. In most instances, the legislature made further exceptions for domestic and various other specific appropriations. All rights to water for municipal water supplies which were acquired before 1909 are confirmed, and certain exclusive rights of water use for municipal purposes are granted. (Moorhouse-Florida)

BELFORD V. CITY OF NEW HAVEN (INDIVIDUAL'S CHALLENGE TO CITY'S DREDGING AND CONSTRUCTION), 364 A.2d 194-200 (Conn. 1976).

Descriptors: *Connecticut, *Dredging, *Recreation facilities, *Environmental effects, Local governments, Channel improvement, Adjacent landowners, Contracts, Public rights, Water sports, Boating, Project planning, Construction, Parks, Natural resources, Facilities, Recreation. Identifiers: Standing(Legal).

Plaintiff residents sought to enjoin defendant city from constructing rowing course and other facili-ties on public park land. City had entered into an agreement with private corporation for lease and construction of complete Olympic facilities on city park premises. The park already contained athletic facilities, including an old rowing course, and the proposed facilities would have nearly unrestricted public use. The affected area had limited wildlife value and minimal damage to resources was an-ticipated. Proposed dredging for the rowing course would cause no permanent damage. Plaintiffs claimed that the proposals constituted a diversion of park lands from proper park purposes, and charged that the construction would result in pollution and destruction of the city's natural resources. The court concluded that only parties with damage distinct from that suffered by the general public had standing to sue for a diversion from park purposes, and that the plaintiffs had no such distinct damage. Under the Connecticut Environmental Protection Act, any person may bring an action for relief against pollution. Here no possible pollution was shown. Nevertheless, the city was directed to get proper approval before proceeding with work in the tidal wetland area. (Molloy-Florida) W77-08143

WOOD V. BOARD OF COMMISSIONERS FOR THE PONTCHARTRAIN LEVEE DISTRICT (LAND APPROPRIATION FOR LEVEES), 338 So.2d 744-47 (La, Ct. App. 1976).

Descriptors: *Louisiana, *Eminent domain, *Levees, *Flood control, State governments, Condemnation, Condemnation value, Levee districts, Public rights, Local governments, Water transfer, Drainage systems, Water policy, Water zoning, Legal aspects, Taxes, Real property. Identifiers: *Groundwater management.

Plaintiff sought recovery of the value of two parcels of vacant land which defendant levee board used to construct or enlarge levees along two separate canals. Both parcels were obtained by plaintiff through tax redemption and quit claim deeds from the tax debtor. The trial court awarded judgement for the plaintiff for the value of the lands in 1949 when the levees were constructed, and plaintiff contended the judgement should be for the amount of land value in 1962 when he discovered the taking. The plaintiff was found correct in his contention that there had never been an attempt by the defendant to acquire a right to either parcel. However, the court found that fact unimportant since the title was in the state, by virtue of the tax delinquency, at the time the land was appropriated. There was no necessity for an express dedication to public use, since the land was not privately owned. The plaintiff's tax redemption was defective and subject to the previous dedication for levee purposes. Since only the plaintiff appealed, his request for increase of the award was refused. (Molloy-Florida) W77-08144

MITCHELL V. CITY OF HIGH POINT (MUNICIPAL LIABILITY FOR DAMAGE FROM OVERFLOW OF PRIVATELY-OWNED STREAM). 228 S.E.2d 634-37 (N.C. Ct. App. 1976). Descriptors: *North Carolina, *Flood damage, *Local governments, *Drainage, Right-of-way, Drainage practices, Ditches, Paving, Streams, Urban drainage, Legal aspects, Surface drainage, Overflow, Flash floods, Culverts, Water control.

Plaintiff landowners sought recovery for property damage suffered in a flood, and alleged defendant city's failure to maintain drainage system in good condition. A creek flows near plaintiff's property and under defendant's road through two culverts which are maintained by the city. The flood was caused by debris blocking the culverts, and plaintiffs contend that defendant had adopted the natural waterway as part of its drainage system such that a duty of inspection and maintenance was created. The city's right to improve streets was noted by the court to be subject to liability for concentrating waters into artificial drains and throwing the waters onto lands and causing injury. However, there was no evidence that the city augmented the flow of water in this case. Controlling and maintaining of culverts under the street did not mean that the city adopted the stream, nor did it constitute a dedication of a private stream to public use. The city exercised no legal control over the stream bed except the road right-of-way, hence the city had no duty regarding other portions of the stream bed and admission of evidence regarding the condition of other portions was prejudicial error. (Molloy-Florida)

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SOLAR SALT COMPANY V SOUTHERN PACIFIC TRANSPORTATION COMPANY (ALTERATION OF SALINE CONTENT OF GREAT SALT LAKE IS NOT POLLUTION UNDER UTAH STATUTE).

55 P24 286-93 (Utah 1976).

Descriptors: *Utah, *Great Salt Lake, *Saline lakes, *Salinity, *Saline water, Bodies of water, Lakes, Salt balance, Judicial decisions, Pollution, Legal aspects, Diversion, Water law, Appropriation, Brine shrimp, Structures, Algae, Competing uses.

Identifiers: *Causeways, *Property rights.

Plaintiff salt production company brought action against defendant railroad to recover for damages resulting from decreased salt content in portion of Great Salt Lake allegedly caused by the construction and maintenance of causeway. The causeway diverted waters entering the lake in such a way as to raise the saline content of the water in the northern portion of the lake, and reduce it in the southern portion. Plaintiff salt mining company sued on the grounds of nuisance, contending that by raising the salinity in the northern part of the lake, the defendant railroad had violated the Utah lake, the defendant railroad had violated the Utah Pollution of Waters Act. The act includes in its definition of pollution 'any alteration' of the waters of the state as will 'render such waters harmful'. The Utah Supreme Court affirmed the summary judgment granted by the Third District Court of Salt Lake County. The court held that lowering the salt content of water is not a public property of the property of the salt content of water is not a public section. nuisance, as the interests of the general public are not affected; nor is it pollution as defined by the statute. The court added that if the statute meant that lowering the salt content was a public nuisance, then the salt company itself would be guilty of a public nuisance whenever it removed salt from the lake's waters. (Sloan-Florida) W77-08146

SIERRA CLUB V STAMM (NATIONAL EN-VIRONMENTAL POLICY ACT DOES NOT REQUIRE COMPREHENSIVE ENVIRONMEN-TAL IMPACT STATEMENT ON LARGE RECLAMATION PROJECT WHEN EIS HAVE BEEN PREPARED FOR VIABLE PORTION OF PROJECT). 6 ERC 1848-54 (D Utah June 21, 1974). Descriptors: *Environmental effects, *Utah, *Federal jurisdiction, *Environmental control, *Cost-benefit analysis, Water quality control, Economic impact, Economic prediction, Economic justification, Economic feasibility, Cost analysis, Water pollution control, Water districts, Reclamation, Projects, Legal aspects, Regional economics.

Identifiers: *National Environmental Policy Act, 100 projects | National Environmental Policy Act, 100 proje

Identifiers: *National Environmental Policy Act, *Environmental Impact Statement, *Injunctive relief.

Plaintiff environmental groups brought this action against defendant federal officers and employees to enjoin continuing construction on the Bonneville Unit of the Central Utah Project, a partially constructed reclamation project designed to develop and provide water for beneficial uses in the state of Utah. Plaintiff contends that defendants failed to comply with the National Environmental Policy Act (NEPA) when they filed an in-adequate final environmental statement (FES), which did not consider alternatives, nor contain an economic or cost-benefit analysis. Plaintiffs further allege that the FES was too narrow in scope since it did not cover all phases of the project. The district court held that plaintiffs failed to show by a preponderance of the evidence that any reasonable alternative was not considered and discussed in the FES, and that it did contain a rigorous exploration of alternative actions. The court found that neither NEPA nor the Council on Environmental Quality (CEQ) Guidelines require a benefit-cost analysis in monetary terms of the beneficial and adverse effects on the environment.
The FES submitted herein fully and adequately describes and analyzes the significant secondary consequences resulting from the project, and is in compliance with NEPA and CEQ guidelines. Furthermore, the requirements of NEPA are satisfied by the preparation of separate impact statements that assess the environmental effect of each independent portion of the project. (Welch-W77-08147

NATURAL RESOURCES DEFENSE COUNCIL V STAMM (NATIONAL ENVIRONMENTAL POL-ICY ACT NOT SATISFIED WHEN EIS FAILS TO DISCUSS ALL REASONABLE ALTERNA-TIVES TO THE PROJECT).

6 ERC 1525-34 (E D Cal April 26, 1974).

Descriptors: *California, *Construction, *Dam construction, Dams, *Regulation, Alternative planning, Water law, Water pollution control, Water mand, Water conveyance, Water storage, Water resources development, Water quality control, Water levels, Water management(Applied). Cost-benefit analysis, Project planning, Damsites, Flood control, Flood data, Flood protection. Identifiers: *National Environmental Policy Act *Injunctive relief, *Environmental impact state-

*Injunctive relief, *Environmental impact statement.

Plaintiff environmental group brought this action against defendant federal officers and agents seek-

Plaintiff environmental group brought this action against defendant federal officers and agents seeking a preliminary and permanent injunction to halt construction on the Auburn Dam portion of the Auburn-Folsom South Unit. Plaintiffs contend that defendant's planned construction and operation of the Unit in violation of the act authorizing such construction, and secondly, that the Environmental Impact Statement (EIS) concerning the Unit failed to comply with the requirements of the National Environmental Policy Act (NEPA) by failing to disclose the mode of operation of water release operations, failing to disclose the growth inducing impacts of the water contracting and pricing policies, and failing to discuss alternative sources of water. The district court held that the burden of proof fell upon plaintiffs, but that in this case plaintiffs had sustained that burden and that NEPA was not satisfied by the EIS submitted. The EIS was legally insufficient since it lacked a critical analysis of the alternatives available to achieve flood control. The court further noted that the EIS

failed to discuss either the water contracting policies or the cost-ratio discussed in the original feasibility studies. An EIS must contain a discussion of reasonable alternatives to a proposed project in a detailed and well reasoned manner in order to qualify as a good faith statement of facts as required under NEPA. (Welch-Florida) W77-08148

MICHIGAN CONFERENCE ASSOCIATION OF SEVENTH-DAY ADVENTISTS V COMMISSION OF NATURAL RESOURCES (PRIVATE LAKES WITH NO OBVIOUS PUBLIC ACCESS CLOSED TO THE PUBLIC).

245 Nw2d 412-14 (Ct App Mich 1976). 3 p.

Descriptors: *Michigan, *Lakes, *Navigable waters, *Non-navigable waters, *Riparian rights, Judicial decisions, Legal review, Legal aspects, Streams, Boundaries(Property), Recreation, Public rights, Public access, Social aspects, Recreation demand.

Identifiers: *Lake Shellenbarger(Mich), Private lakes

Plaintiff is the owner of a tract of land which includes a 100-acre lake. The lake has no inlet, as it is spring fed, and only a small creek outlet. The small creek outlet is possibly navigable by a small boat. Plaintiff owns all land surrounding the lake and all land on both sides of the outlet stream up to a certain public highway. Plaintiff sued for and received a declaratory judgment that his lake was non-navigable, private and not subject to use by the general public. Defendant, the Michigan Commission of Natural Resources, challenged the ruling on appeal. The appellate court affirmed the declaratory judgment in Plaintiff's favor. Relying on established Michigan precedent, the courd determined that the public may be excluded from a privately owned lake to which there is no readily apparent public access. The fact that the creek outlet may have been navigable was found to be unimportant. The court concluded that the availability of access by water to a lake which is otherwise private does not necessarily mean that the lake is open to public use. (Moorhouse-Florida) W77-08149

UNITED STATES V OSAGE COMPANY (REMOVAL OF SUNKEN BOATS OBSTRUCTING NAVIGABLE WATERS OWNER'S RESPONSIBILITY).
414 F Supp 1097-1103 (W D Pa 1976).

Descriptors: *Pennsylvania, *Ships, *Submergence, *Judicial decisions, Navigable waters, Rivers, Negligence, Barges, Penalties(Legal), United States, Governments, Costs, Water law, Salvage value, Legal aspects, Obstruction to flow, Streamflow, Federal government. Identifiers: *Navigation obstructions.

The United States Government, as plaintiff, brought an action against a barge owner to recover the cost of removing a sunken barge and for civil penalty. Defendant corporation alleged that the ship sank through no fault of its own, and therefore that it was not liable for the removal cost incurred by the Government. Defendant-owner failed to present any evidence providing that the barge left the mooring site by accident or by innocent misfortune. The United States District Court found that the barge constituted an obstruction in navigable water, and that the owner was required to prove that the sinking of the barge din ot occur through its negligence, and that opinion evidence of nonnegligence was not sufficient to rebut the presumption of negligence. The Court also held that the owner of the barge was liable for the cost of removal incurred by the Government, but that civil penalty would not be imposed against it. (Martin-Florida)

Group 6E-Water Law and Institutions

UNITED STATES V TULARE LAKE CANAL COMPANY (RECLAMATION LAWS CON-CERNING SALE OF LAND IN EXCESS OF 160

535 F2d 1093-1144 (9th Cir 1976).

Descriptors: *Water delivery, *Federal reclamation law, *Irrigation programs, *Land tenure, *Cost repayment, Dams, Multiple-purpose pro jects, Reclamation, Water, Contracts, Federal government, Water storage, Water rights, Economics, Irrigation, Farms, Pricing, Value, and appraisals, Legislation, Construction costs, Legal aspects, Canals.

Plaintiff federal government sought to enjoin defendant canal company from delivering water from a reclamation project to any owner of land in excess of 160 acres unless the owner had executed a recordable contract with the Secretary of Interior requiring him to sell his excess acreage at a price which excluded the enhancement value due to the project. The plaintiff contended that such land owners were bound by Section 46 of the 1926 Onnibus Adjustment Act requiring the contract.

The defendant contended that its repayment of a portion of the construction costs of the reclamation project exempted the land owners from Section 46. The district court held for the defendant. The Ninth Circuit Court of Appeals reversed.

After an in depth examination, the court said the 1944 Flood Control Act did not exclude this project from the acreage limitation of the reclamation laws. The corr also rejected the defendant's contention that 1., 34 5 p of construction costs exempted the lando " ers. The court said this would thwart the congressional purpose of discouraging land speculation in the project area. (Capehart-Florida) W77-08151

CANADIAN PACIFIC (BERMUDA) LIMITED V UNITED STATES (NO DUTY TO SURVEY OR DREDGE CHANNEL AT ANY PARTICULAR

534 F2d 1165-70 (5th Cir 1976).

Descriptors: *Shoals, *Accidents, *Navigable waters, Ships, Channel improvement, Florida, Dredging, Channels, Negligence, Damages, Legal aspects, Federal government, Surveys, Sand bars, Navigation, Sounding, Judicial decisions.

Identifiers: Proximate causation, Navigation obstructions, River pilots.

Plaintiff ship owner sought damages in admiralty from defendant United States for negligent maintenance of a waterway. The plaintiff's ship ran aground on a shoal in the St. John's River. The Corps of Engineers had surveyed the section of the river in question and had knowledge of the shoaling condition. The plaintiff contended that the defendant had a duty to advise the pilot's association of the shoaling condition. The plaintiff further contended that the defendant had a duty to dredge the river so as to eliminate the shoals. The trial court entered judgment for the plaintiff. The United States 5th Circuit Court of Appeals reversed; holding that the federal right of regulation of navigable waterways does not imply a duty of federal maintenance of such waterways. Noting the pilot's testimony that he would not have navigated the ship differently if he had had the defendant's information, the court further held that the defendant's failure to notify the pilots was not a cause of the accident. (Capehart-Florida) W77-08152

COMPLIANCE WITH THE PROVISIONS OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED IN 1972.
Cal Water Code Ann secs 13370 thru 13382 (West

Supp 1976).

Descriptors: *California, *Water pollution control, *Permits, *Interstate rivers, State governments, Legal aspects, Control, Legislation, Water quality, Federal government, Pollutants, Govern-mental interrelations, Penalties(Legal), State iurisdiction, Political aspects, Social aspects, Regulation, Management, Water treatment, *Federal Water Pollution Control Act.

Identifiers: *Water discharge requirement, Injunction(Prohibitory), Licenses, Notice, Effluent limitations, Administrative regulations, Certifica-

California, pursuant to the Federal Water Pollu-tion Control Act (FWPCA), has established a permit system to regulate the discharge of pollutants into the navigable waters of the United States. The discharge of any radiological, chemical or biologi-cal warfare agent into state waters is flatly prohibited. Any person who discharges other pollutants into state waters is required to submit a request for a waste discharge requirement. Such waste discharge requirements will be issued only after proper notice, and only for a five year period All interested parties are afforded an opportunity to be heard. Water discharge requirements may be terminated for violation of the terms of the requirement, obtaining such requirement by misrepresentation, or a change in conditions which requires the elimination of a particular discharge. In addition, civil and criminal penalties are provided for violation of the waste discharge requirements. The statute requires that waste discharge requirement holders implement the best pollution control technology by 1977 and also meet any further technological advancement by 1983. (Moorhouse-Florida) W77-08153

WELLS, PUMPING PLANTS, CONDUITS AND STREAMS.

Cal Water Code Ann secs 7000 thru 7075 (West

*California, *Conduits, Descriptors: *Legal aspects, *Canals, *Streams, Streamflow, Constructures, Irrigation canals, seepage, Diversion structures, Judicial decisions, Water law, Legislation, Water permits, Natural streams, Bridges, Wells, Canal design, Ditches. Identifiers: Citizen suits, Standing(Legal), Surface mining, Dredging operations.

Any persons associated in the use of a conduit, well, or pumping plant are liable for the reasonable expenses of repair and maintenance in proportion to their actual use thereof. Any person paying more than his share of such expenses may bring an action for contribution against a non-paying user, and for a declaration of rights of the respective water users to determine the proportionate expen-ses of each. California has further provided that any resident or freeholder in a road district may, upon filing of the required bond, petition for the opening or alteration of a canal for the convenience of one or more residents of such district. However, no canals or other conduits may be laid so as to obstruct any highway. Every conduit built across a pre-existing highway must comply with county and state standards. All conduits in place for more than thirty years, and all approved bridges, shall be maintained and improved by the public agency having jurisdiction over the highway. In contrast, the flow of water of any stream to the intake of any canal for public or agricultural use may be maintained by the person in charge of the use. Such maintenance, shall not, however, prevent the maintenance or building of reclamation or flood control levees or the use or enlargement of any natural channel for municipal purposes. The alteration of the course of any stream in a surface mining dredging operation, without prior approval is expressly prohibited. (Moorhouse-Florida) W77-08154

REAR RIVER COMPACT.

Utah Code Ann secs 73-16-1 thru -2 (1968).

Descriptors: *Idaho, *Utah, *Wyoming, *Water rights, Legislation, Water utilization, Administration, State governments, Legal aspects, Regula-tion. Water law, Institutions, Interstate, Water policy, Water resources development, Projects, Planning, Reservoirs, Jurisdiction, Priorities, Prior appropriation, Water storage, Eminent domain, Condemnation, Canals, Interstate compacts, Governmental interrelations. Identifiers: *Bear River Compact(Ida-Uta-Wyo).

Idaho, Utah and Wyoming have agreed to the Bear River Compact, which sought to remove the causes of controversies over the distribution and use of the waters of Bear River. The participants in the compact were concerned about the efficient use of water, additional development of water resources, and promoting interstate comity. The Bear River Commission was established for the purpose of setting policy, adopting laws, rules and regulations and investigating, constructing and operating projects providing for the maximum beneficial use of the water. Procedures regarding water emergencies and storage rights in reservoirs are set forth in the text of the compact. Each signatory state can acquire water rights in one state for use of water in another state provided the exercise of eminent domain shall be in accordance with the law of the state in which such property is located, and any facilities constructed shall be subject to the law of the state where the facility is located. Compact provisions are to be reviewed every twenty years, but can be terminated at any time by the unanimous agreement of the signatory state. (Hadoulias-Florida) W77-08155

ROARD AND DIVISION OF WATER RESOURCES.

Utah Code Ann. secs. 73-10-1 thru -4 (Supp. 1975).

Descriptors: *Utah. *Water conservation. *Water utilization, Legislation, Administration, Governments, Legal aspects, Regulation, Water law, Institutions, Interstate, State governments, Water policy, Water management(Applied), Water resources, Water resources development, Water yield improvement, Competing uses, Water contracts, Reclamation, Economics, Administrative agencies Projects, Underground streams. Streams

The Utah state legislature reaffirms the state public policy of managing the water resources so that they can be put to the highest use for public benefit, including domestic uses and irrigation of lands. The legislature urges co-operation with state and federal agencies to obtain maximum vields from underground waters and small streams, creating a revolving fund so that every mountain stream and water resource can be made to render the highest beneficial service, and constructing projects to increase the beneficial use of water. The Board of Water Resources, consisting of seven members appointed by governor, has been created, and shall assume the responsibilities created, and shall assume the responsibilities previously performed by the Utah Water and Power Board. Additional powers and duties include authorizing studies for the promotion of water and power resources, power to enter into contracts for construction of conservation projects, to sue and be sued, to contract with federal and other agencies, and to consider and recommend on behalf of the state regarding reclamation projects or water development projects by state or United States agencies. (Hadoulias-Florida) W77-08156

BOOM COMPANIES: CONSTRUCTION, POWERS OF

W Va Code Ann secs 31-3-1 thru 31-3-11 (Supp

Descriptors: *West Virginia, *Lumbering, *Streams, Legislation, Dams, Water law, Administration, State governments, Local governments, Rivers, Access routes, Saw mills, Facilities, Legal aspects, Water rights, Penalties(Legal), Banks, Surface waters, River flow, Tributaries, Streamflow Identifiers: *Booms, Intentional torts.

Any corporation, incorporated in West Virginia for the Express purpose of boom construction is authorized to construct booms in the rivers and streams of the state, wherever such booms are necessary to stop and secure boats, rafts, logs, mosts, spars, lumber and other timber. However, no boom may be constructed in any navigable stream. Each boom corporation shall have exclusive control over the use and flow of the waters within two miles above and below its principal boom. Each corporation may do whatever is necessary for getting logs to, down, and from the river on which its boom is located. Any person willfully or maliciously destroying or defacing any boom or boomed timber shall be guilty of a misdeameanor and liable for treble damages in an action by the corporation. Similarly, if any logs become lodged on improved lands while sustained. but removal, destruction, or conversion of such timber by the landowner shall be a punishable misdemeanor. No log owner shall unreasonably delay driving such loop into a boom so as to obstruct the use of the stream for others. However, once within a boom, the corporation is liable for all damages except sinking, floods, and fire provided the log owner has filed a memorandum with the clerk of the county court describing the marks and brands used to identify his timber. (Moorhouse-Florida) W77-08157

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Wyo Stat Ann secs 41-26 thru 41-46 (1959), as amended, (Supp 1971).

Descriptors: *Wyoming, *Beneficial use, *Permits, Legislation, Unappropriated water, Water storage, Ditches, Reservoirs, Water rights, Irrigation, Streams, Diversion, Alteration of flow, Irrigation practices, Obstruction to flow, Reasonable use, Water utilization, Relative rights, Industrial production, Municipal water, Conveyance structure, Administration, Water law, Institutions, State governments, Administrative agencies.

Any person, corporation, association or organiza-tion intending to store or impouund for beneficial use, any unappropriated waters of Wyoming shall apply to the state engineer for a permit to con-struct a reservoir. Secondary permits are granted for the appropriation of stored water for the irriga-tion of any lands. However, such stored water may be discharged into the natural flow of streams in situations where the natural stream waters have been appropriated or obstructed in such a manuer that the waters are insufficient to irrigate the land. The natural stream flow can then be diverted in an amount equal to the stored water for irrigation of the land. Under the 1971 Amendments, water may be diverted for industrial and municipal puurposes as well. However, applications for permits to divert the stream water must be filed in the form of secondary permits, and maps, and other informa-tion must show the ditches. The 1971 Amendments require that the accompanying maps show other means of conveyance through which the natural flow of the stream is to be conveyed, the lands to be irrigated or the place of the industrial or mu-nicipal use, and the point at which the stored water will be discharged into the stream. (Hadoulias-W77-08158

WINKLE V MITERA (RIPARIAN RIGHTS OF AN ISLAND OWNER), 241 NW2d 329-34 (Neb 1976), 1 map.

Descriptors: *Judicial decisions, *Land sub-Descriptors: "Judicial decisions, "Land sub-sidence, "Nebraska, Rivers, Legislation, Legal aspects, Law enforcement, Legal review, Water law, Submergence, Subsidence, Ownership of beds, Boundaries(Property), Islands, Adverse possession, Accretion(Legal aspects), Navigable rivers, Riparian rights, Navigable waters, Adverse possession

The defendants appealed the decision of the District Court, quieting title in favor of the plaintiff to a portion of land adjoining the island in question, which had been submerged at one time, but was now reappearing. The Supreme Court of Nebraska noted that under Nebraska law once land has eroded, original title is obliterated. Nebraska law also dictates that ownership of an island includes all the land from the island to the center of the river channel. Consequently, when the disputed land finally reemerged, ownership vested in the plaintiff's predecessor in title, as owner of the sland. The court refused to recognize the defendant's claim to title from the tax foreclosure sale, since no notice of the sale was given to the plain-tiff's predecessor. The court also refused to recognize title by adverse possession, because the de-fendants failed to claim open and exclusive pos-session. The Supreme Court therefore affirmed the District Court's judgement in favor of the plaintiff. (Hadoulias-Florida)
W77-08159

COASTAL ZONE LEGISLATION: LOUISIANA LANDMARKS, LABYRINTHS LOGROLLING,

Louisiana State Univ., Baton Rouge. Center for Wetland Resources. J. R. Van Lopik.

In: The Present and Future of Coasts: Proceedings of the First Annual Conference, November 1975, Arlington, Virginia, Hayden B.P., ed., The Coastal Society, Bethesda, Maryland, p. 37-48. 5 ref.

Descriptors: *Louisiana, *Legislation, *Wetlands, *Management, Regulation, Coordination, Governments, Administrative agencies, Marshes, Coastal marshes, Salt marshes, Tidal marshes, Bayous, Ecosystems, Petroleum, Estuaries, *Estuarine en-

vironment.
Identifiers: Coastal zones, *Coastal zone management, *Coastal Zone Management Act of 1972, Marshlands, Estuarine ecology, Marine resources.

More coastal marshlands are found along the coastline of Louisiana than along the entire eastern seaboard of the United States. In 1971 the governor established an advisory commission to investigate the problem of coastal zone manage-ment, which at that time was fragmented among twenty-six state agencies in addition to the Corps of Engineers. This commission returned 40 recommendations which form the foundation of work being done on a coastal zone management bill under the federal Coastal Zone Management Act of 1972. Whether the bill is to be passed by the state legislature will require compromise between environmentalists, who want considerable detail as to decision-making guidelines, and legislators, who believe that inordinate detail will preclude any chance of passage. The problems to be con-sidered in formulating a management plan include: the complexity of the problems of ecosystem func-tion, multiple use considerations, and institutional arrangements; economic impacts and management costs; and coordination and control problems among the local, state, and federal agencies. The major areas of concern are the need for additional knowledge regarding the coastal zone, and for increased communication of the knowledge pos-sessed by state agencies and by universities. (Sloan-Florida) W77-08186

FINAL REPORT OF COMMITTEE VII (FINAL RECOMMENDATIONS OF THE INTERNA-

TIONAL CONFERENCE ON WATER LAW AND

ADMINISTRATION), In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (COPLANRH), Caracas, Venezuela,

Descriptors: *International law, *Water users, *Water resources development, *Water management(Applied), International waters, Water meni(Applied), International waters, water utilization, Water supply, Water sources, Water rights, Water resources, Water policy, Water law, Water control, Water allocation(Policy), Education, Research and development, Research priorities, Basins, Governments, Legislation, Law of the Sea, Compensation, Groundwater basins, Groundwater resources, Groundwater. Identifiers: Expropriation.

The committee report includes recommendations at two levels--national and international. In its recommendations at the national level it suggests nine principles for governments to consider re-garding ownership, use, and protection of water resources. The committee also recommends principles in connection with institutional aspects and research. Guidelines concerning water policy, groundwater resources and planning are also discussed. Various legal and institutional criteria aimed at providing effective instruments for water management are listed. Among these criteria is the recommendation that compensation for acquired water rights not necessarily be paid since a change in the legal regime of water resources does not constitute a case of expropriation. The committee recommends government action in the legal regulation of water and the human environment, as well as in education, research and training in water law and administration. At the international level suggested actions include assistance to developing countries with respect to the utilization of water resources, systematized international water resource rules, and principles to be used when basins are internationally shared. (Rieck-Florida)

NEW WATER LEGISLATION-DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION, Wyoming Univ., Laramie. Coll. of Law.

In: Proceedings of the International Conference on Global Water Law Systems, International Association for Water Law, September 1-9, 1975, Valencia Spain; published by Colorado State University, Ft. Collins, Colo. 80523, p 1154-1184, 1976. 31 p, 49 ref.

Descriptors: *Legislation, *Water policy, *Water rights, Water law, Permits, Administration, Planning, Research, Water pollution, Water resources, Water shortage, Water supply, Legal aspects, Regulation, Institutions, Water management(Applied), Priorities, Preferences(Water rights)

Identifiers: *Comparative law, *Phillipines,

New water laws must be drafted to meet the needs of a rapidly changing world. These new laws must be designed not only to facilitate efficient allocation of resources and protection of the environ-ment, but must also consider social and national goals. The scope of this paper is that part of water law which governs the activities of persons who withdraw and use water for beneficial purposesthe law of water rights. Prior to drafting the author of new water laws should consult local officials who are familiar with the problems, constraints and objectives of the particular area. All water laws should define the scope of the law, and the uses and users of the water resources. Common problems which may arise include: implementing preferences and permits; preserving and register-

Group 6E-Water Law and Institutions

ing existing rights; allocating priorities; and implementing administrative controls. The author analyzes various methods of allocating water rights including, temporal priority, equal sharing enforced by proportionate reduction, statutory lists of preferences, administrative discretion, and sale or auctions of water. The author concludes that temporal priority is the preferred method because it cultivates security in the ownership of property rights. The author uses a comparison of the systems of controlling water rights in the Philippines and Swaziland to illustrate his conclusion. (Hadoulias-Florida) W77-08188

UNIVERSITY PUBLIC SERVICE PROGRAMS AS THEY RELATE TO WATER RESOURCES MANAGEMENT IN WISCONSIN,

Wisconsin Univ. Extension, Madison. Inland Lake

Demonstration Project. S. M. Born, M. T. Beatty, and D. A. Yanggen. August 1972. 10 p, 1 tab, 15 ref.

Descriptors: *Water resources development, *Water management(Applied), *Natural resources, *Planning, *Land use, *Institutions,

*Education, *Wisconsin.
Identifiers: *Water Resources Act of 1965,
*Inland Lake Demonstration Project, *Shoreline Management Program, Upper Great Lakes Regional Commission.

The historical and current role of the University of Wisconsin in public policy dealing with water resource management is analyzed. The University has helped shape and define the mission of restructured state agencies, aided general acceptance of planned comprehensive approaches to solving natural resource problems, educated constituents regarding new programs, and, through administrative and legislative efforts, increased the number of environmentally oriented programs by local government. The University should be the research and education arm of government and its policies. The role the University and its Extension Division can play in water related public policy is described in regard to the Water Resources Act of 1965. Within the Act, the University became heavily involved in the educational effort to inform the public of the Shoreline Management Program. Also shown is how applied research is integrally tied to demonstration projects in the analysis of the University's role in the Inland Lake Demonstration Project sponsored by the Upper Great Lakes Regional Commission. Detailed descriptions of current University programs in the water resource area are given, including University Extension, County Extension programs, Public information and public policy programs, University involvement in regional planning for water resources management, and specific University organizations such as the Water Resources Center, the Institute for Environmental Studies, Water Resources Management Program, and various inter-departmental involvement. (Gentry-NC) W77-08209

IMPROVING INSTITUTIONAL ARRANGE-MENTS FOR WATER DEVELOPMENT IN THE **IMPROVING** STATE OF WASHINGTON: DEVELOPMENTAL AND ENVIRONMENTAL TRADE-OFFS AND CONSTRAINTS,

Washington Univ., Seattle. Inst. of Governmental Research.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-267 919, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, June 1976, 177 p. OWRT A-057-WASH(1), 14-31-0001-3848.

Descriptors: *Institutions, *Water resource development, *Washington, *Institutional constraints, Organizations, State governments, Networks, Environment, Decision making.

The networks of institutional arrangements in this study consist of federal, state, local, and regional study consist of rederat, state, local, and regional organizations, including the processes they use in planning and developing the functions of irrigation, water supply, electricity generation, navigation, flood control, soil conservation, forest conservation, fish and wildlife conservation and outdoor recreation. The networks are also expected to trade off the values of water development with the values of environmental protection and growth. Each of the networks was originally designed to reach certain objectives: comprehensive, multipurpose, long-range planning and development of river basins; economic efficiency; engineering or technical efficiency; administrative efficiency; and political consensus. The objective of environmental protection was recently added, and, to a limited degree, growth control. The networks have achieved only a moderate degree of success in achieving the objectives. The decision-makers have been using a fragmented model which has made it difficult to set priorities, and to establish the consequences of actions and the decision-making by many groups. It would not be politically feasible, because of certain ideological barriers in the setting in which the networks operate, to use a centralized model for future network design purposes. Rather the principles of the non-structural solution, project smallness and decentralization are likely to be acceptable and effective. Some new organizational structures are suggested, how-W77-08284

WATER SUPPLY AND CONTROL DEVELOP-MENTS SUMMARIZED, (ARIZONA). From the State Capitals, (Bethune Jones, Asbury Park, N.J.), Water Supply Report No. 6, p 1-2, June 1, 1977.

*Water law, Descriptors: *Water alloca-Groundwater, Water managetion(Policy). ment(Applied), *Arizona, *Legislation. Identifiers: *Groundwater law, *Groundwater legislation.

A plan to solve immediate probles with ground water transfer and to set up a commission to develop a state water management plan was recently announced by Arizona state legislative leaders. The bill is designed to meet immediate needs but sets up a process for more comprehensive water management for the state in the future. If approved, existing ground water pumping operations in critical areas would be allowed to continue with a certificate of exemption from the Continue with a certificate of exemption from the State Land Department. A recent state Supreme Court ruling prohibited the pumping of groundwater from one parcel to another, thereby threatening several Tucson area mining operations and necessitating a change in Arizona's ground-water law. The bill sets up a 23-member commission to devise a water management plan in a two-year time period. (Eberle-NWWA) W77-08313

THE ERDA GEOTHERMAL PROGRAM, Energy Research and Development Administra-tion, Washington, D.C. For primary bibliographic entry see Field 4B. W77-08314

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS: ECONOMIC, LEGAL, AND FINAN-CIAL ASPECTS, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. For primary bibliographic entry see Field 6B. W77-08345

METHODOLOGY AND DATA FOR ANALYZ-ING QUANTITY, QUALITY AND ECONOMIC ASPECTS OF MINIMUM STREAMFLOWS, AP-PENDICES, VOLUME 2,
Washington Univ., Seattle. Dept. of Economics.

For primary bibliographic entry see Field 5G.

FROM GOOD HUSBANDRY TO REASONABLE USE: ILLINOIS SURFACE WATER DRAINAGE LAW EVOLVES IN SUBDIVISION CASE. For primary bibliographic entry see Field 4A. W77-08353

THE IMPORT - EXPORT CLAUSE AND CON-TROL OF OIL POLLUTION: REGULATORY FEE IMPOSED PURSUANT TO THE POLICE

For primary bibliographic entry see Field 5G. W77-08354

EPA FOCUSES ON MUNICIPAL ENFORCE-MENT. P. S. Ward

Journal Water Pollution Control Federation, Vol 48, No 9, p 2114-16, September 1976.

Descriptors: *Municipal wastes, *Administrative agencies, *Environmental control, *Water permits, *Sanitary engineering, Waste disposal, Legal aspects, Permits, Water law, Environmental engineering, Environment, Waste water disposal, Waste water treatment, Wastes, Sewage treatment, Control, Regulation, State governments, Federal government, Sewage, Municipal water, Water quality.

Identifiers: *Administrative regulations, *Permit

compliance process, *Municipal enforcement.

The Environmental Protection Agency's (EPA) Water Enforcement and Water Program Operations Offices have presented a draft report on the municipal enforcement at EPA. The report, analyzing the interaction between and EPA and state municipal waste facilities programs, advocates an immediate strenthening of the agency's management control over the municipal compliance process. Among the report's major recommendations made in response to the discovered ineffectiveness of the compliance process are: to dramatically increase the rate of EPA and state response to identified violations; to improve tracking procedures and documentation of response and follow-up activity; to make compliance schedules more closely related to the construction grant process; and to clarify EPA priorities with respect to the resolution of operational problems. At EPA request, the Committee of Ten (an advisory group to EPA) had its subcommittee also present its own reort on municipal enforcement. The report focuses on regulatory reponse to permit noncompliance and advocates a regulatory policy that is neither so severe as to encourage a detrimental backlash nor so lax as to be ineffectual. This report goes beyond the EPA report is stressing the need for extensive integration of many programs that will in the long run influence municipal compliance. (Anderson-Florida) W77-08355

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TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY
GUIDELINES AND STANDARDS. EFFLUENT Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W77-08356

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY PRETREAT-MENT STANDARDS. Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W77-08357

COASTAL ENERGY IMPACT PROGRAM. National Oceanic and Atmospheric Administra-tions, Washington, D.C. Federal Register, Vol 42, No 3, p 1164-87, January

Descriptors: *Coastal structures, *Coastal en-gineering, *Energy, *Management, Administrative agencies, Federal government, State government, agenties, recent government, State government, Local governments, Economic impact, Regula-tions, Control, Planning, Comprehensive planning, Long-term planning, Area redevelop-ment, Estimated costs, Financial feasibility, Re-

ment, Estimated costs, Financial Reasonaly, Signonal development.
Identifiers: *Coastal Zone Management Act of 1972, Coastal zones, Coastal energy impact fund, Coastal Energy Impact Program, Outer Continental Shelf, Coastal energy activity, Coastal waters, Administrative regulations.

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The National Oceanic and Atmospheric Adminis-tration has established interim-final regulations defining the procedures by which coastal states and local governments can qualify for impact assistance under the Coastal Energy Impact Pro-gram. The program is aimed at meeting state and local needs resulting from coastal energy activity and Outer Continental Shelf (OCS) energy activity. by To be eligible for assistance, a coastal state must be receiving a grant under section 305 of the Coastal Zone Management Act, must have an approved coastal zone management plan under section 306 of the Act, or must be making satisfactory progress toward the development of a manage-ment program. Each year a list of coastal energy activities is compiled which forms the basis for allotments among the coastal states. Calculations iotiments among the coastal states. Calculations are then made regarding the increased employment and population likely to result from construction or expansion of the energy facilities on the list. Such calculations will produce a 'need factor' for the various states. Allotments will then be made to the states who will have responsibility for distribution among their local governmental units. (Moorhouse-Florida) W77-08358

TOXIC POLLUTANT EFFLUENT STANDARDS

FOR BENZIDINE.
Environmental Protection Agency, Washington, For primary bibliographic entry see Field 5G. W77-08359

EFFLUENT GUIDELINES AND STANDARDS FOR FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, NITRIC ACID SUB-CATEGORY.

Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W77-08360

A NEW MEASURE OF DAMAGE FOR WRONG-FULLY APPROPRIATED WATER, For primary bibliographic entry see Field 4A. W77-08361

RIGHTS IN PENNSYLVANIA

Pennsylvania Dept. of Environmental Resources, Harrisburg. Office of Enforcement. R. T. Weston.

Temple Law Quarterly, Vol 49, No 3, p 515-57,

Descriptors: *Pennsylvania, *Public rights, *Navigable waters, *Recreation, Bodies of water, Legal aspects, Non-navigable waters, Beds under water, Civil law, Common law, Lake beds, Lakes, Legal review, Low water mark, High water mark, Navigable rivers, Public access, River beds, Rivers, Streambeds, Streams, Water rights, Water law, Beds.

Identifiers: *Navigability tests, *Public trust doctrine, *Water rights(Non-riparians), *Navigational servitude.

The issues of public rights in, and use of, the waters within Pennsylvania are important to the economic, social and environmental development of the state. The origins of public rights in surface waters stem from English law and early federal jurisdiction over navigable water ways. Waters which are navigable in fact are declared public rather than private. A review of both federal and state standards reveals a wide variation as to what constitutes navigable waters, and ultimately to what are private or public, waters. In Pennsyl vania, the beds of navigable rivers and lakes are held in trust for the public. The public, therefore, has a right of unencumbered use of these waters. Between the high and low water marks, the public has a right of servitude or easement. The conflict regarding the use of Pennsylvania's private but has a right of servitude or easement. The conflict regarding the use of Pennsylvania's private but navigable lakes has not yet been resolved. Pennsylvania approaches public rights to lakes and streams on an ad hoc basis leaving behind the rubric of navigability. Definitive statement of the public's right in surface waters awaits judicial resolution or legislative action. (Morse-Florida) § W77-08362

REMEMBERING MAINE: OFFSHORE FEDERALISM IN THE UNITED STATES AND CANADA,

Toronto Univ. (Ontario). Faculty of Law.

California Western International Law Journal, Vol 6, No 2, p 296-322 (1976).

Descriptors: *Federal jurisdiction, *Oceans, *International waters, *Federal-sstate water rights conflicts, Federal government, Judicial decisions, State jurisdiction, Water rights, Jurisdiction, Legal aspects, Governmental interrelations, Political aspects Coordination, Continental, shalf cal aspects, Coordination, Continental shelf, Proprietary power, Regions, *United States, *Canada, Australia. Identifiers: *Seabeds.

The danger of international rivalries over marginal sea area exploitation renders persuasive an ener-getic federal government role in the marginal sea area. There continues to be a state-federal/provincial-federal issue concerning rights connected to marginal seabeds in both the United States and Canada. The United States Supreme Court has held that national external sovereignty is the critical factor in deciding controversies over seabeds in favor of the federal government. The court stated that federal authority over marginal court stated that federal authority over marginal seabeds hinges on the federal defense/foreign relations capacity, with national rights being paramount. The Canadian Supreme Court's decisions resemble the opinions of the United States Supreme Court in empowering the Dominion Parliament to impose laws having extra-territorial operation. Possible future jurisdictional problems in Canada may be resolved through the use of politicolegal strategies relied upon in both Australia and the United States. The underlying concept of these strategies is one of cooperation between the states and the federal government to establish a single administrative regime rather than to divide the territorial seabed into areas. (Rieckto divide the territorial seabed into areas. (Rieck-Florida) W77-08363

STATES' RIGHTS IN THE OUTER CONTINENTAL SHELF DENIED BY THE UNITED STATES SUPREME COURT,

A. W. Anderson A. w. Anderson. University of Miami (Florida) Law Review, Vol 30, No 1, p 203-15 (1975).

Descriptors: *Submerged lands, *Maine, *United States, *Continental shelf, *Federal-state water rights conflicts, Legal aspects, Legal review, Federal government, Boundary disputes, Judicial

decisions, Federal jurisdiction, State jurisdiction, Ownership of beds, Water law, Governmental in-terrelations, Governments, Legislation, Sub-merged Lands Act.

Identifiers: Territorial sea(Jurisdiction), Coastal waters, *Outer continental shelf.

In response to Maine's issuance of a permit for oil and gas exploration of the outer continental shelf off its coast, the United States sought a declaration that Maine and 12 other states had no rights in the shelf. The U. S. Supreme Court agreed that na-tional sovereignty required exclusive national ownership of the seabed and subsoil from the 3 mile territorial sea to the outer continental shelf. Other states had claimed state ownership of sub-merged lands on the basis of sovereignty and the exercise of dominion prior to admission to the United States. Those claims were defeated, but Congress, in response, quit claimed the 3 mile territorial sea to the states. Maine asserted the same historical claim to ownership in the instant case. The Supreme Court, rejecting the argument that Congress had abrogated the federal paramount rights doctrine in quit claiming the territorial sea relied on the necessity of exclusive national sovereignty. The court thus confuses dominion over mineral resources and property rights with sovereignty in the international arena. Congress has properly recognized that the right to conduct foreign affairs does not require exclusive federal control over the domestic allocation of benefits and burdens of submerged lands. (Moorhouse-Florida) W77-08365

SOVEREIGNTY AND THE CONTROL OF WATER POLLUTION, For primary bibliographic entry see Field 5G.

W77-08366

THE ENVIRONMENTAL PROBLEM OF THE OCEANS: AN INTERNATIONAL STEPCHILD OF NATIONAL EGOTISM,

N. E. Abrams. Environmental Affairs, Vol 5, No 1, p 3-32 (Winter 1976).

Descriptors: *United Nations, *Environmental effects, *International commissions, *Oceans, *Political aspects, *Political constraints, International waters, International law, Regulation, United States, Water, Water rights, Economic impact, Economics, Economic justification, Competition, Governments, Governmental interrela-

Identifiers: *Law of the sea, *Law of the Sea Con-

Protection of the ecological balance of the world's oceans is difficult to accomplish since international agreements regarding the seas are primarily concerned with defining political and economic rights of the participating nations. The author attempts to show that international conventions are generally inadequate, and more importantly, that the practice of treating environmental responsibili-ty for the oceans according to traditional notions of state sovereignty is a serious error. Focusing on the 1975 United Nations Law of the Sea Conference as the most comprehensive attempt to date to codify the rights and obligations of individual states with respect to the sea and to each other's maritime interests, the author demonstrates the devastating effects of regional politics and the lack of international sensitivity. The author suggests that the problems of preservation of the marine environment be treated separately from the problems of re-writing the law of the sea for maximum achievement of ecological goals. (Josepher-Florida) W77-08367

Group 6E-Water Law and Institutions

LEGAL CONTROL OF CONSUMPTIVE WATER USE IN PENNSYLVANIA POWER PLANTS.

Pennsylvania Dept. of Environmental Resources, Harrisburg. Office of Enforcement. For primary bibliographic entry see Field 3E. W77-08368

AQUACULTURE: PROBLEMS OF IMPLEMEN-TATION UNDER EXISTING LAW, British Columbia Univ., Vancouver. Faculty of

R. C. McCutcheon. University of British Columbia Law Review, Vol 10, p 289-319 (1976). 139 ref.

Descriptors: *Aquiculture, *Navigable waters, *Riparian rights, *Commerical fishing, International law, Governments, Economic impact, Legal aspects, Water rights, Ownership of beds, Water law, Canada, Flow, Fisheries, International waters, Non-navigable waters, Stream-beds, Tidal waters, Pipelines, *Canada. Identifiers: *British Columbia, Coastal waters.

oceanographic and topographical characteristics of the British Columbian coastline make it a prime area for aquaculture. However, entrepreneurs are forwarned of inherent problems. Aquaculture facilities are by necessity constructed in navigable waters and pose harmful obstacles to navigators and possible liability to aquaculturists. Adequate warning systems are imperative. Facilities built upon non-tidal waters may conflict with reparian rights. The aquaculturist would probably be required to compensate the riparian owner or obtain a lease from him. Additionally aquaculture may conflict with fishing. In non-tidal areas, water lot leases would be required but in tidal waters the government possesses the power to control fish-ing. The aquaculturist would be left the task of convincing the government of the true public value of his activities. The construction of aquaculture facilities would restrict other possible uses of public waters. Once again the aquaculturist would be forced to prove his endeavors are worth the cost. A final problem to be faced by the aquaculturist is the damage that could be done to his stock by the construction of submarine pipelines and ca-bles in his underwater area. (Moorhouse-Florida)

PROPOSED EFFLUENT GUIDELINES AND STANDARDS FOR IRON AND STEEL MANUFATURING.

Environmental Protection Agency, Washington, D.C.

For primary bibliographic entry see Field 5G. W77-08370

EFFLUENT GUIDELINES AND STANDARDS FOR CANNED AND PRESERVED FRUITS AND VEGETABLES POINT SOURCE CATEGORY, Environmental Protection Agency, Washington, D.C.

For primary bibliographic entry see Field 5G. W77-08371

SHOULD RIVERS HAVE RUNNING. TOWARD EXTENSION OF THE RESERVED RIGHTS DOCTRINE TO INCLUDE MINIMUM STREAM FLOWS, Idaho Water Resource Board, Boise.

S. W. Reed.

Idaho Law Review, Vol 12, No 2, p 153-67 (1976).

Descriptors: *Idaho, *Reservation doctrine, *Appropriation, *Beneficial use, Legal aspects, Prior appropriation, Water law, Water rights, Diversion, Unappropriated water, Federal reservations, Aquatic lide, Aquatic animals, Fish, Aquatic plants, Ecosystems, Biological communities, Rivers, Streams, Aquatic environment, Indian reservations.

Identifiers: *Standing(Legal), Reserved rights doctrine, Indian water theory.

Following the notion of standing for natural obects, standing for rivers and the natural creatures living in them is advocated herein. Western water law (prior appropriation of water for beneficial use determines right) is compared with Indian con-cepts of water rights. The Indians did not believe in ownership of water because it was an integral part of the ecosystem in which all forms of life had equal rights. Recently the Idaho legislature recognized non-economic uses of streams when it provided for recreation uses. The recognition was, however, still phrased in terms of human benefit. Protection of life dependent on stream flow is the rtue issue, since pollution and diversion destroy aquatic life not people. The reserved rights doc-trine may provide the medium for legal recognition of these rights. It maintains that all federal reservations have a right to use of water from included and adjacent streams and rivers to make those reservations productive. Prior appropriation for beneficial use need not be shown. Similarly, the rights of animate and inanimate objects to an dequate instream flow of water should be implied from the ecosystem itself without need for economic justification. (Moorhouse-Florida) W77-08372

THE 1972 WATER POLLUTION CONTROL ACT: UNFORESEEN IMPLICATIONS FOR LAND USE PLANNING,

For primary bibliographic entry see Field 5G. W77-08373

FLOOD PLAINS FOR OPEN SPACE AND RECREATION.

Bureau of Outdoor Recreation, Washington, D. C. For primary bibliographic entry see Field 6F. W77-08374

THE WINTERS DOCTRINE AND HOW IT GREW: FEDERAL RESERVATION OF RIGHTS TO USE OF WATER,

Office of the Solicitor (Interior), Washington, D. C.

H. A. Ranquist. Brigham Young University Law Review, Vol. 1975, No. 3, p. 639-724 (1975). 346 ref.

Descriptors: "Federal government, "Reservation doctrine, "Water rights, "Indian reservations, Prior appropriation, Federal-state water rights conflicts, Administrative agencies, Irrigation water, Diversion, Legal aspects, Reasonable use, Federal reservations, Public lands, Riparian rights, Judicial decisions, Federal jurisdiction, State jurisdiction, Arizona, California, Colorado, Withdrawn lands, Water law.

Identifiers: *Western United States, *Winters doctrine, *Aboriginal water rights, *Indian water rights.

Various historical factors resulted in three different approaches to water law in the evolution of legal systems in the Western states, as opposed to the uniform adherence to the English common law doctrine of riparian rights in the East. Because the Western states each created and enforced their own systems, a pattern of reliance on state law developed, and the role of federal law was ignored for many years. In 1908, however, the Supreme Court held in Winters v. U. S. that there is a right in the federal sovereign to reserve water on Indian reservations. This principle, known as the Winters doctrine, was affirmed in subsequent decisions and eventually expanded to uphold claims asserted by the United States to waters on other federal lands. As the doctrine has developed judicially, with no statute dealing directly with the subject, the states have opposed its development in many areas. The result has been confusion, conflict, and controversy between federal and state interests and disagreement among legal scholars. The author suggests an administrative scheme which bring all users of the water in contested areas into a single forum having jurisdiction over the water and the parties. (Sloan-Florida) W77-08375

PLANNING CHALLENGES IN THE MANAGE-MENT OF COASTAL ZONE WATER RESOURCES,

Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W77-08376

WATER FOR FOOD - OR FOR MORE IMPORTANT PURPOSES. (REALLOCATION OF IRRIGATION WATER TO CITIES AND INDUSTRIES),

Wyoming Univ., Laramie. Coll. of Law. F. J. Trelease.

In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (COPLANARH), Caracas, Venezuela, Vol. 15, 1976. 22 p, 21 ref.

Descriptors: *Irrigation effects, *Water utilization, *Preferences(Water rights), *Irrigation water, *Water allocation(Policy), Appropriation, Food abundance, Water law, Foods, Productivity, Cost allocation, Environmental effects, Social aspects, Beneficial use, Water distribution(Applied), Water management(Applied), Legislation, Agriculture, Industrial water, International law, Cost repayment, Compensation.

Irrigation water, which had previously been al-located for agricultural uses, is presently being reallocated to supply city and industrial water needs. Although the reallocations are 'logical and necessary', the author suggests that the realloca-tions should be reconsidered because they cause economic dislocations and food crises. The author discusses and analyzes various state, national and international laws which govern reallocations and preferential use of water. The indirect effects of these laws include: (1) declining food production; (2) forced transfers which generate insecurity in farmers; (3) great social costs, such as displaced agricultural workers and disruptions in rural life and values; and (4) failure to consider all alternative solutions. The author concluded that the use and reallocation of water should be practical and functional. The correct approach is to weigh all the social and economic costs and benefits, and to insure that all losses to harmed parties include full compensation. Finally, the crucial question should be whether the particular transfer is the best solu-tion to that problem. (Hadoulias-Florida) W77-08377

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EMERGING LEGAL CONCEPTS IN THE HAR-MONIZATION OF WATER RESOURCES DEVELOPMENT AND ENVIRONMENTAL PROTECTION,

Fordham Univ., N.Y. School of Law.

L. A. Teclaff.

In: Proceedings of the International Conference
on Water Law and Administration, International
Association for Water Law, February 8-14, 1976,
Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (COPLANARH), Caracas, Venezuela,
p. 1023-1046, 1976. 52 ref.

Descriptors: *United Nations, *Environmental effects, *International commissions, *Environmental control, Foreign countries, Governments, Governmental interrelations, Legal aspects, Federal government, Administrative agencies, Regulation, Social aspects, Standards, Water policy, Administration, Project planning, Benefits, Cost allocation, Cost-benefit analysis, Resources.

Water Law and Institutions-Group 6E

Identifiers: *National Environmental Policy Act, Stockholm Conference of the Human Environ-ment, *United Nations Environment Programme, Administrative regulations, Environmental impact

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Recently environmental protection has moved from a conflict between development and conser-vation to active protection of environmental convation to active protection of environmental concerns by ensuring their adequate representation in
development considerations. In the United States
this theory is evidenced by the impact statement
called for by the National Environmental Policy
Act of 1969. Such statements must be filed by
federal agencies before the initiation of any project which significantly affects the environment.
The statement is a detailed examination of any impact on the environment, as well as any irreversible commitments to resources. The purpose is to
allow more informed decision-making. The Council on Environmental Quality has developed
guidelines for agencies to use which ensure that
environmental considerations get due weight. The
weakness of the process lies in the area of review. environmental considerations get due weight. The weakness of the process lies in the area of review. Agencies are generally left on their own in deciding whether the project should proceed. Court review is possible, but on an ad hoc basis only. The United Nations has recognized that one nation's development can seriously affect the ecology of a fellow nation and proposed a similar system. Nations should report proposed development to other nations with an analysis of environmental impact and resource commitment. The United Nations Environment Programme has been developed to issue guidelines. As in the United States, compliance is conditioned on good faith as no true final arbiter can be established. (Moorhouse-Florida)

TICKET TO THERMIDOR: A COMMENTARY ON THE PROPOSED CALIFORNIA COASTAL PLAN,

PIAN, University of Southern California, Los Angeles. School of Law. For primary bibliographic entry see Field 6B. W77-08379

REPORT ON WATER RESOURCES PROBLEMS OF WESTERN COLLIER COUNTY, FLORIDA AS AFFECTED BY THE GAC CORPORATION'S CANAL SYSTEM IN ITS GOLDEN GATE DEVELOPMENT PROJECT,

Florida Univ., Gainesville. Coll. of Law.

F. E. Maloney.

Available from Eastern Water Law Center,
University of Florida, Gainesville, Florida 32611. Price \$1.40. In: Phase 1 Golden Gate Estates Redevelopment Study Collier Co., Florida, p M-1 to M-28 (June 1975).

Descriptors: *Florida, *Flood control, *Saline water intrusion, *Legal aspects, Surface drainage, Comprehensive planning, Zoning, Canals, Eminent domain, Local governments, Non-structural alternatives, Wildlife conservation, Waste water disposal, Planning, Water zoning, Constitutional law, Coastal marshes, Groundwater, State governments.

governments.
Identifiers: *Coastal waters, Citizen suits, Administrative regulations.

The land and water management of western Colli-er County in its present form will be destructive of the environment of nearby bays and forests, in ad-dition to being inadequate for flood control. In order to preserve the ecological integrity of the order to preserve the ecological integrity of the area re-planning is necessary, including returning to use as wetlands those areas best suited for that purpose. This action would deter harm to the coastal areas of the county, and would alleviate the substantial danger of salt water intrusion in land. Such action would, however, return a substantial portion of the Golden Gates Estates area to a non-developable condition, and the resulting nise in ground water level would impair the developers' contracts for sewage facilities. Nevertheless, the regulation would be a reasona-ble approach to a legitimate end. Moreover, alter-native waste disposal methods are available. Suffinative waste disposal methods are available. Sufficient public purpose exists to use eminent domain to acquire the land needed for return to its natural state, both in flood-prevention and protection of fish and wildlife. Methods of implementation for the stated goals are discussed, for example, state, county, and federal regulations, and citizens' suits in the federal courts. (Molloy-Florida) W77-08380

PUBLIC HEARING REGARDING 180-DAY NOTICE TO THE SANTA FE LAND IMPROVEMENT COMPANY OF VIOLATION OF STATE AND FEDERAL WATER QUALITY STANDARDS FOR THE INTERSTATE WATERS OF THE KANSAS AND MISSOURI RIVERS, HELD AT KANSAS CITY, KANSAS ON 13 JULY 1971. For primary bibliographic entry see Field 5G. W77-08381

ENVIRONMENTAL LAW-APPLICATION OF THE REFUSE ACT OF 1899 TO CONTINUAL INDUSTRIAL DISCHARGES IS UPHELD WITHOUT FORMALIZED PERMIT

PROCEDURES, For primary bibliographic entry see Field 5G. W77-08382

EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR NEW SOURCES FOR THE BLEACHED KRAFT, GROUNDWOOD, SULFITE, SODA, DEINK AND NON-INTEGRATED PAPER MILLS SEGMENT OF THE PULP, PAPER, AND PAPERBOARD POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.

For primary bibliographic entry see Field 5G. W77-08383

RESTLESS RIVER: INTERNATIONAL LAW AND THE BEHAVIOR OF THE RIO GRANDE, Texas Univ. at Austin. Dept. of Geography. J. E. Mueller.

Texas Western Press, El Paso, 1975. 155 p, 13 map, 9 photo, 15 tab. \$5.00.

Descriptors: *Boundaries(Property), *Mexico, *Rio Grande River, *International Boundary and Water Commission, Federal government, Rivers, Running waters, International Joint Commission, International law, Legal aspects, International waters, Treaties, Accretion(Legal aspects), Avuision, Boundary disputes, Bank erosion, Banks, Fluvial sediments, Meanders, River flow, Estua-

Identifiers: Dam effects, Reliction.

The history of the Rio Grande as the international boundary between Mexico and the United States is divided into five distinct segments. The first era, the pre-boundary stage existed while Colonial powers rearranged their North American holdings. powers rearranged their North American horizings.

It alerted Mexico to the need for a Northern Boundary. The second era lasted from 1848 to 1884 and was characterized by a fixed line boundary between the two countries. Era three, lasting from 1884 to 1905 utilized the Rio Grande as the exclusion. sive boundary. This proved totally unsatisfactory sive boundary. This proved totally unsatisfactory as the scant vegetation and low clay content alouf the banks provided little resistance to highly variable water discharges. The result was a highly erratic and wandering river leading to untold boundary disputes. The fourth era lasted from 1905 to 1970 and was known as the midlly-variable line era since large dams built along the river tamed its flow. The last era arises from a 1970 treaty. Severe restrictions on water discharge and an agreement to restore a channel to its boundary course after a shift, guarantees that the river as a boundary will become fixed in succeeding decades. (Moorhouse-Florida) W77-08384

OIL SPILLS AND SPILLS OF HAZARDOUS SUBSTANCES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations. For primary bibliographic entry see Field 5G. W77-08385

AMERICAN FROZEN FOOD V TRAIN ('GUIDELINES' AND 'EFFLUENT LIMITATIONS' FOR THE POTATO PROCESS INDUSTRY PURSUANT TO THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS

539 F2d 107-65 (DC Cir 1976). 2 append.

Descriptors: *Effluents, *Industrial wastes, *Food processing industry, *Water pollution control, *Water quality control, Pollution abatement, Water pollution, Wastes, Water pollution sources, Industrial plants, Judicial decisions, Legal review, Federal government, Administrative agencies, Legal aspects, Permits. Identifiers: *Federal Water Pollution Control Act Amendments of 1972/Amendments of 1972), *American Frozen Food Institute, *Potato Processors of Idaho, Pollution control guidelines, Effluent limitations, Administrative regulations, Congressional hearings on Water Pollution Control Act of 1972.

Petitioners-representatives of the potato processing industry sought a review of an order of the Environmental Protection Agency (EPA) with respect to the issuance of guidelines and effluent limitations for the industry. Petitioners alleged that the Administrator of the EPA had violated the Federal Water Pollution Control Act (FWPCA) Amendments of 1972, and abused his discretion. The court ruled that it had jurisdiction of the case, and that the Administrator's interpretations were and that the Administrator's interpretations were valid. It was ruled permissible for the Administrator to establish guidelines and effluent limitations on the same day and in the same document proorded advance notice of the proposed action was given to the industry. In this case it was. The Administrator was not required to set guidelines and limitations for individual point sources of pollutant discharges, but rather was permitted to establish them by categories and sub-categories of industry. them by categories and sub-categories of industry. The Administrator was permitted to use two Canadian plants as 'exemplary plants' for establishing guidelines and limitations provided that the technology used there was also available to industries in this country. The Administrator's addition of fecal coli to the list of controlled pollutants without notice to the industry was held violative of the Administrative Procedures Act; that single point was remanded for further consideration. (Moorhouse-Florida) W77-08386 W77-08386

LIABILITY FOR DAMAGES TO ADJACENT LAND OR BUILDING CAUSED BY DREDGING, D. Ytreberg. 62 ALR 3d 526-34 (1975).

Descriptors: *Dredging, *Damages, *Negligence, *Adjacent landowners, Legal aspects, Legal review, Water law, Accidents, Hazards, Risks, Common law, Permits, Public rights, State governments, Riparian land, Governments, Social aspects, Judicial decisions. Identifiers: *Strict liability, *Absolute liability, Liability, Ultra hazardous activity, Inherently dangerous activity.

dangerous activity.

In response to damages resulting from dredging operations, land owners have sought recovery on several legal theories, including the common-law right to lateral support from adjacent property, ex-

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traordinarily risky operations imposing strict liability and simple negligence. Courts have deemed the common-law right to lateral support from adjacent property inapplicable to adjacent lands un-derwater. Courts have based their refusal to apply such a doctrine on the fact that the underwater land is in the ownership of the state holding it in trust for the people. Anyone who dredges in relation to such land does so by statutory authoriza-tion, and thus there is no liability for any resulting damages. Only one court has held that dredging is an inherently dangerous or extraordinarily risky activity. This theory will probably remain closed to litigants. The most common theory of recovery for dredging damage has been simple negligence. In such an action the plaintiff must prove both that the dredging proximately caused his damage, and that the dredger breached the standard of care common to all dredgers in the community. Plain-tiffs have been successful in approximately half the cases. (Moorhouse-Florida) W77-08387

RUSSO V. NEW YORK DEPT. OF ENVIRON-MENTAL CONSERVATION (LIMITS OF STATE REGULATIONS RESTRICTING ALTERATION OF WETLANDS).

391 NYS2d 11-12 (Sup. Ct. 1977).

Descriptors: *New York, *Wetlands, *Eminent domain, *Conservation, Salt marshes, Tidal marshes, Preservation protection, Real property, Property values, Constitutional law, Legislation, Water law, Legal aspects, State governments, State jurisdiction Identifiers: *New York Tidal Wetlands Act.

When New York's Tidal Wetlands Act went into effect in 1973, it placed a moratorium against al-teration wetlands. Plaintiff was co-owner of real property in a tidal salt marsh which was affected by the moratorium. He applied to the State Department of Environmental Conservation for a permit to construct a one-family home and it was denied. Plaintiff alleged in this appeal from the denial that the act as applied deprived him of all reasonable use and enjoyment of his property so as to constitute a taking of it without compensation. The court held that while the State has the power to temporarily restrict the use of land, the duration cannot be unreasonable; and where there is no indication as to when the moratorium will end, the constitutionality of its provisions is subject to renewed inquiry. (Jones-Florida) W77-08388

HIBISCUS HARBOR, INC. V. STATE (METES AND BOUNDS DESCRIPTION FAVORED OVER LOW WATER MARK IN DETERMINING OUT-COME OF BOUNDARY DISPUTE). 391 NYS2d 510-13 (Sup. Ct. 1977).

Descriptors: *New York, *Boundaries(Property), *Islands, *Boundary disputes, Judicial decisions, Water law, Lakes, Low water mark, Legal Water level fluctuations, Water levels, Mapping, Water level fluctuations, Water table, Measurement, State governments, Real property. Identifiers: Property, *Property interests, *Metes and bounds

Plaintiff, the purported property owner, brought action to determine title to island property. Defendants include owners of cottages on the disputed tract who claim title by adverse possession, and the state. Plaintiff contended that it had title to the island based on two Letters Patent, which are fully described in metes and bounds and are further supported by field notes describing the parcel with a map. The plaintiff argued that the descriptions could only be interpreted to include title to the island, or in the alternative that its title extended to the low water level of the lake which would be located east of the island, thus encompassing the island. The court held that it was impossible to determine what the level of the lake was at the time of the Letters Patents. Since the natural level of the lake could be varied by man, the court declined to fix a location for the low water line. Instead, by relying on a more recent survey which coincided exactly with the metes and bounds of the Letters Patent the court found that the plaintiff did not own the disputed property. The court declined to decide defendants' claim of adverse possession. (Petruff-Florida) W77-08389

AUBERT V TOWN OF FRUITA (SENIOR DIRECT FLOW RIGHTS FAVORED DISPUTE OVER DAM). 559 P2d 232-35 (Colo Sup Ct 1977).

Descriptors: *Colorado, *Dams, *Flow control, *Prior appropriation, Water rights, Domestic water, Streams, Water law, Reservoir storage, Water control, Control, Flow, Water storage, Reservoirs, Legal aspects, Competing uses, Riparian rights, Judicial decisions. Identifiers: *Estoppel, *Direct flow rights.

Plaintiff owners sought an injunction directing defendant town to cease violating their senior direct water flow rights. The lower court granted the injunction and the defendant town appealed. The defendant's sole argument on appeal is the alleged err of the trial court in rejecting the defendant's affirmative defenses of estoppel, laches, and waiver. The lower court found that the defendant, utilizing its right to store water for domestic use, built an on-channel reservoir and dam in 1935 and enlarged it in 1959, 1962, and 1967. The enlarged dam blocks the entire flow on the west fork of a creek. The plaintiffs hold direct flow rights downstream on this creek which are senior to defendant's rights. The trial court found that since 1959 the plaintiffs and their predecessors had protested this inter-ference with their direct flow rights. The lower court held that this evidence was sufficient to keep the defendant from asserting estoppel. The state supreme court affirmed and in dicta set out estoppel principles to be used in the context of a water law case. (Petruff-Florida) W77-08390

BANK OF AMERICA NATIONAL TRUST AND SAVING ASSOCIATION V STATE WATER RESOURCES CONTROL BOARD (CONDITION PLACED ON WATER PERMIT DEFEATED FOR LACK OF EVIDENCE OF NECESSITY). 116 Cal Rptr 770-80 (Ct App 1974).

Descriptors: *California, *Appropriation, *Public access, *Reservoirs, *Diversion, Real property, Recreation, Fishing, Water management(Applied), Municipal water, Irrigation, Water permits, Land development, Competing uses, Water law, Legal aspects, Rivers, Streams

Appellant was a corporate trustee of land being developed for a labor union training center. It filed several applications with respondent water board for authorization to appropriate water from a river and unnamed streams running through the property. The board granted the applications, attaching, however, a condition that the reservoirs created by the diversions were to be kept open to the public for recreational use. The intention was to compensate the public for diminished recreational value of the river and effects on fishing resulting from the diversions. The court on appeal examined the record for substantial evidence to support the imposition of the condition and found it lacking. The court looked to the fact that the fish and game commission and appellant had agreed upon detailed conditions regulating the amount and periods of diversion to assure fish protection; and it looked to the lack of evidence of impairment of recreational facilities. The condition was ordered deleted and the matter remanded to the board to reconsider its approval of the applications for water appropriation. (Jones-Florida) W77-08391

ANDERSON V YEAROUS (RIGHTS OF DOMI-NANT OWNERS TO UNOBSTRUCTED USE OF DRAINAGE EASEMENTS) 249 NW2d 855-65 (Iowa 1977).

Descriptors: *Easements, *Surface runoff, *Iowa, *Flooding, *Ditches, Surface waters, Water rights, Legal aspects, Flow system, Floods, Floodways, Drainage, Drainage rights, Legar aspects, Flow system, Floodwater, Floodways, Drainage, Drainage water, Drainage systems, Right-of-way, Water conveyances, Levees, Judicial decisions. Identifiers: "Dominant tracts, "Servient tracts, "Dominant owners, "Servient owners,

*Dominant owners, *Servient owners, *Prescriptive rights, Waterflow, Nuisance, In-

Plaintiff owner of dominant tract (land benefitted by adjacent tract) depended on drainage ditch built by his predecessor to carry water runoff across the property of defendant owner of servient tract (land burdened by adjacent tract). Defendants' predecessor dug a trench to carry the water from plaintiff's higher land across defendants' lower land to a nearby river. Thereafter, plaintiff and defendant bought the two adjacent tracts. Defendants erected a levee to stop the water flow from plaintiff's land causing water to back up and flood plaintiff's crops. Plaintiff sued in equity asking for a permanent injunction against defendants to prevent further obstruction of the water flow, and for damage to his crops. The court took notice that the drainage ditch had been in use for 30 years before defendants' erected their levee. At the time defendants bought their tract, they had notice of plaintiff's easement (right-of-way). The court held that plaintiff had a prescriptive easement (legal right resulting from continued use). Also, it held that although the ditch began as an artificial waterway, it had ripened into a natural waterway and therefore defendants' levee unreasonably obstructed a 30 year flowage system and constituted an enjoinable nuisance. (Denker-Florida)

WATER RIGHTS GENERALLY; APPROPRIA-

Idaho Code Ann secs 42-101 thru -112 (1948), as amended, (Supp 1976).

Descriptors: *Idaho, *Appropriation, *Beneficial use, *Preferences(Water rights), *Water allocation(Policy), Priorities, Prior appropriation, Legal aspects, Water law, Water rights, Administration, Allotments, Water control, Water permits, Water measurement, Water loss, Diversion, Alteration of flow, Water management(Applied), Diversion loss returns, Irrigation, Irrigation ditches.
Identifiers: *Licenses, *Groundwater manage-

ment.

All the waters of Idaho when flowing in their natural channels, are the property of the state, and thus under its control. However, the beneficial use of diverted public waters is not considered a property right, but rather an appurtenance to the land-a right which the state may only deny upon the failure to pay ordinary assessments for delivery of the water. The right to the use of unappropriated waters must comply with the license procedure provided for in this title, and must be for some beneficial purpose. The 'first in time is the first in right' doctrine governs priority among appropriators utilizing the waters of running streams, as well as seepage, waste or spring waters. Prior ap-propriated waters may be diverted into the channel of another stream, and then reclaimed with an allowance for loss by evaporation and seepage. This exchange of water must be approved by the department of water resources and agreed upon by the persons involved in the exchange. Although a change in the point of diversion is permitted, a change in the course of a ditch used for conveying and selling waters for irrigation purposes is prohibited if it interfers with those purposes. (Anderson-Florida) W77-08393

AMERICAN PETROLEUM INSTITUTE V EN-VIRONMENTAL PROTECTION AGENCY (CHALLENGE TO EPA STANDARDS FOR REFINERIES UNDER THE FWPCA AMEND-MENTS OF 1972). 540 F2d 1023-39 (10th Cir 1976).

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onveying poses is ourposes. Descriptors: *Federal government, *Permits, *Industrial production, Water pollution, Administrative agencies, Pollution abatement, Legislation, Regulation, Water pollution sources, Water pollution control, Oil industry, Oil wastes, Judicial decisions, Water policy, Water quality standards, Legal energy.

Legal aspects.
Identifiers: *Federal Water Pollution Control Act (FWPCA) Amendments of 1972.

Petitioner refineries and organizations requested review of Environmental Protection Agency (EPA) regulations published pursuant to the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. The establishment of effuent limitation was challenged for lack of authority, noncompliance with the act, and on the authority, noncompliance with the act, and on the factual ground that the record does not sustain the action of the EPA. Since the statute demands preventive action, and factual certainty regarding future technologies is impossible, the court considered only whether the record supporting the promulgated standards was adequately adduced and rationally applied. The court observed that permits can be issued by the EPA or a complying state, thus the regulatons were a reasonable exercise of a congressionally delegated power. The general standards were found to be presumptively applicable unless rebutted by a permit applicant. Variances were considered a rule-making prerogative, although there was no statutory provision for variances to the 1977 standard. In reviewing the factual record, the court upheld limitations for exrationarces to the 17/7 stantage. In reviewing the factual record, the court upheld limitations for existing sources except for stormwater runoff, and upheld new source limitations, but found no reasonable basis for the 1983 existing source limitations. (Molloy-Florida)

APPROPRIATION OF WATER FOR POWER (HYDROELECTRIC POWER PROJECTS), Ore Rev Stat secs 543.110 thru .320 (1973).

Descriptors: *Hydroelectric power licensing, *Oregon, *Appropriation, *Electric power production, *Permits, Administrative agencies, State governments, Local governments, Bodies of water, Federal government, Electric powerplants, water, redetar government, Electric power plants, Electric power industry, Social aspects, Manage-ment, Water demand, Economic impact, Water al-location(Policy), Water management(Applied), Water supply, Water users, Hydroelectric power, Hydroelectric plants. Identifiers: Oregon Water Resources Board, Cer-

tification, Licenses, Administrative regulations, Oregon statutes.

Oregon has enacted regulations to be followed by those wishing to appropriate water for the produc-tion of electricity. Such regulations do not apply to those wishing to appropriate water for the production of electricity. Such regulations do not apply to hydroelectric projects constructed by the federal government. All individuals seeking to appropriate water must first submit an application to the State Water Resources Board. All interested parties will be notified of the application and a public hearing will be scheduled. At the hearing the board will rule upon the appropriateness of granting the water use license. Factors considered include the maximum economic development of the water involved, the amount of water available for appropriation, and all other state formulated water resources policies. Licenses issued shall not exceed fifty years in duration. Licensees are expected to follow all regulations established by the State Engineer as well as maintain their projects in good order and repair. The State Engineer is authorized to waive all licensing procedures for projects of less than 100 horsepower. The State Engineer may also grant a preliminary permit for a period not exceeding two years. The terms and conditions of such a preliminary permit are to be established by the State Engineer. The State Engineer may, in his discretion, cancel a permit. (Moorhouse-Florida) W77-0839

IRRIGATION AND IRRIGATION DISTRICTS. Kan Stat Ann secs 42-106 thru -358 (1972).

Descriptors: *Kansas, *Irrigation, *Irrigation districts, *Distribution systems, Irrigation operation tricts, "Distribution systems, Irrigation operation and maintenance, Irrigation practices, Irrigation systems, Irrigation water, Water rights, State governments, Local governments, Legislation, Water contracts, Irrigation ditches, Embankments, Irrigation canals, Irrigation engineering, Water distribution(Applied), Irrigated land, Eminent domain.

Identifiers: *Kansas irrigation districts, Kansas

Irrigation districts may be established in Kansas by a petition of three-fourths of the landowners within a proposed district. Such petition is sub-mitted to the board of county commissioners which creates the district. Irrigation districts may utilize existing water channels to supply water or cut new ditches. Right-of-way for new channels can be obtained through the power of eminent domain. Once acquired, the right-of-way remains unless there is a period of non-use for two consecutive years. Irrigation districts as well as other canal companies are charged with keeping their dams, locks and gates, embankments and all other equipment in good order and repair. Such entities are liable for damages resulting from faulty equip-ment. If purchasers of water from any irrigation company consider the rates for such water to be unreasonable or unjust, complaints may be filed with the state corporation commission. The com-mission shall hear testimony and determine the mission shall near testimony and determine the validity of the complant. Provisions are also made for the drilling of individual artesian wells and the recording of rights in relation thereto. (Moorhouse-Florida)

W77-08396

ARTESIAN WELLS.

Idaho Code Ann secs 42-1601 thru -1605 (1948).

Descriptors: *Idaho, *Artesian wells, *Well permits, *Well regulations, Water wells, Artesian heads, Public rights, Mechanical control, Mechanical equipment, Water conservation, Water control, Water policy, Water permits, Water storage, Water structure, Water loss, Water management(Applied). Identifiers: Public nuisance, Nuisance(Legal aspects), Groundwater management.

Artesian wells which are uncapped or which are not equipped with approved devices to control the flow of water from such wells are declared to be a public nuisance in the state of Idaho. However, if the waters of artesian wells are reservoired and controlled so as to prevent waste, the commiscontrolled so as to prevent waste, the commissioner of reclamation may except such wells from being declared a nuisance. Owners, occupants and possessors of land upon which artesian wells are located may not lawfully permit the continuance of waste or nuisance resulting from such wells. However, domestic users may insert small stop and waste corks in the piping of the wells and use the water taken therefrom for domestic purposes. Persons installing or reprosing to install mechacial Persons installing or proposing to install mechaical capping devices on an artesian well must apply to the commissioner for approval of the control device. Artesian wells are defined to include any actrice. Artesian wells are defined to include any artificial hole made in the ground through which water naturally flows from subterranean sources to the surface of the ground for any length of time. (Josepher-Florida) W77-08397

RIPARIAN OWNER'S RIGHT TO NEW LAND CREATED BY RELICTION OR BY ACCRE-TION INFLUENCED BY ARTIFICIAL CONDI-TION NOT PRODUCED BY SUCH OWNER. 63 ALR3d 249-303 (1975).

Descriptors: *California, *Riparian rights, *Accretion(Legal aspects), *Artificial use, Legal aspects, Judicial decisions, Riparian land, Water law, Natural flow doctrine, Avulsion, Alteration of flow, Obstruction to flow, Relative rights, Water rights, Bodies of water.

Identifiers: *Reliction.

Cases are herein annotated where the actions of man have served as an artificial catalyst for the natural processes of accretion or reliction. This in-cludes accretion which is a direct result of action of waters, even though the course of such waters has been influenced by some artificial means, but does not include changes wrought by avulsion. The claimant riparian owner must have no direct part in causing the accretion. The primary problem is disagreement as to how and where the accretion occurred so the court generally reconstructs the movements of the water body from the original surveys to the filing of the suit. Cases involving litigation between private parties, and between public entities and private parties, are included. While most jurisdictions support the proposition that alluvial deposits belong to the owner of the land, California courts have awarded the accreted land to the state or its grantees rather than to the upland owner. Consequently, California cases stand apart from the general weight of authority. (Rieck-Florida) W77-08398

UNITED STATES V 3,727-91 ACRES OF LAND IN PIKE COUNTY, STATE OF MISSOURI (COMPENSATION ALLOWED DRAINAGE DISTRICT FOR CONDEMNED PROPERTY). 416 F Supp 525-29 (E D Mo 1976).

Descriptors: *Missouri, *Condemnation value, *Condemnation, *Drainage districts, Judicial decisions, Water law, Legal aspects, Value, Compensation, Economic impact, Governments, Levee districts, Governmental interrelation, Levees, Ditches, United States, Real property.

Identifiers: Property interests, Condemned property, Nominal damages.

Defendant drainage district, owner of property condemned by the United States, sought compen-sation for the taking of its lands. The district was the owner of 214 acres of levees and ditches constructed to protect real property in the area from floods. The levees were 53 to 54 years old at the date of taking and in poor condition. Various opinions on the proper market value of the proper-ty were presented to the court. The government ar-gued that the District was entitled to only nominal damages on the grounds that the District existed to serve a public function, and since there was no necessity of providing substitute levees and ditches the government had actually relieved the District's maintenance burden. The court agreed, finding this condemnation similar to that of public streets, which absent a showing of need for substitute facilities is non-compensable. The court continued, assuming arguendo the inapplicability of the former theory, to question of proper valua-tion. Finding none of the testimony sufficiently credible to establish market value, the court used reproduction cost less depreciation as a means of determining compensable value. Based on testimony that the useful life of such levees was 50 years, at the time of taking the levees was 50 years, at the time of taking the levees were fully depreciated and again the District was entitled only to nominal damages. Judgment was entered for \$1.00. (Moorhouse-Florida) W77-08399

Group 6E-Water Law and Institutions

ENGINEERS OF STATE (COST/BENEFIT ANALYSIS UNDER NEPA AND THE FLOOD CONTROL ACT). 411 F Supp 1261-76 (ND Ala 1976).

Descriptors: *Channels, *Cost-benefit analysis, *Alternative planning, *Environmental effects, *Alabama, State governments, Federal government, Administrative agencies, Flood control, Damages, Creeks, Recreation, Excavations, Construction, Fish, Wildlife, Flood plain zoning, Diversion structures, Insurance, Interest rates, Judicial decisions, Governmental interrelations. Identifiers: *Environmental impact statement, Injunctive relief, National Environmental Policy Act, Crop insurance, *Tombigbee River Valley

Water Management District.

Plaintiff state attorney general sought to enjoin defendant federal agency from continuing a stream channelizaton project. The project was planned to provide flood control for urban areas and agricultural lands along the creek. The plaintiff contends that the defendant's decision to implement the project was arbitrary and capricious because (1) the cost-benefit analysis did not include a consideration of environmental losses such as destruction of recreational activities, and (2) a lack of consideration was given to alternative proposals, such as flood plain zoning, crop insurance, or other flood control structures, which would have minimized environmental harm. The United States District Court for the Northern District of Alabama issued a preliminary injunction. The court held that environmental factors which can be quantified in economic terms must be included in the cost-benefit analysis of an environmental impact statement. The court further held that sufficient consideration of alternatives was required. (Capehart-Florida) W77-08400

OHIO LIQUID DISPOSAL, INC V DAWE (DEFINING 'WATERS OF THE STATE' WITHIN WATER POLLUTION CONTROL 347 NE2d 541-46 (Ohio Ct App 1975).

Descriptors: *Ohio, *Subsurface waters, *Waste disposal wells, *Well permits, *Liquid wastes, *Judicial decisions, Industrial wastes, Environmental sanitation, Pollutants, Waste disposal, Administrative agencies, Industrial water, Environmental effects, Legislation, Ecology, Water law, Regulation, Water quality control, State jurisdiction, Permits, Legal aspects, Well regulations.

Plaintiff corporation collects liquid industrial waste by-products. The plaintiff sought a permit from the Chief of the Division of Oil and Gas for the state of Ohio to inject these liquids into an existing stratigraphic well. The Chief initially approved the permit after determining that no unreasonable risks to oil and gas resources would arise from waste contamination. The Water Pollution Board (WPB), in violation of applicable statutes, refused to grant the permit without a prior hearing. The plaintiff appealed the decision to the Common Court of Pleas. The court noted that the Ohio Statutes do not allow injections of industrial wastes into 'waters of the state'. The court determined, however, that the stratigraphic wells were not 'waters of the state', and therefore or-dered that the permit be granted. The Court of Appeals affirmed, and ascertained as well, that state supervision was not necessarily terminated because the Chief can still impose such conditions on the permit as may be necessary to protect the environment. The WPB was also estopped from asserting error that the plaintiff, by mandamus, should have forced them to give prior notice be-fore refusing the permit. (Hadoulias-Florida) W77-08401

COMMISSION INTERSTATE STREAM (CREATION, MEMBERSHIP, GENERAL POWERS). New Mexico Stat. Ann. secs 75-34-1 thru -3, 75-34-MEMBERSHIP. 10 thru -12 (1968)

Descriptors: *Water districts, *Irrigation districts, *New Mexico, *Interstate commissions, *Interstate rivers, Water resource development, Equitable apportionment, Governments, State governments, Political aspects, Water policy, Condemnation, Water law, Water conservation, Water control, Water management(Applied), Legislation, Irrigation, State jurisdiction. Identifiers: New Mexico Interstate Stream Com-

The New Mexico Interstate Stream Commission consists of nine members, eight appointed by the and the ninth governor for a term of six years member is the state engineer. Each appointed member shall be a representative of a major irrigation section. The members of the commission shall serve without compensation, but may receive reimbursement for expenses incurred while actually engaged in the performance of their duties. The commission has the power to negotiate compacts with other states for the purpose of settling controversies, or providing for equitable distribution of waters in interstate stream systems. The commission has various investigative and development functions centering around the systems of the state, interstate or otherwise. The commission may acquire, when deemed proper. by condemnation, purchase or exchange any land, rights, water rights or easements which are necessary for construction or operation of works authorized to be maintained by the commission. The cost of any such construction shall be met with the proceeds of revenue bonds authorized or by a grant from the federal government. The purpose of the statute is to meet a state-wide need for conservation, protection, and development of the water resources. (Welch-Florida)

CITY OF YORK V. PENNSYLVANIA DEPART-MENT OF ENVIRONMENTAL RESOURCES (DELEGATION OF AUTHORITY UNDER THE PENNSYLVANIA WASTE MANAGEMENT

364 A.2d 978-980 (Pa. Commonwealth 1976).

Descriptors: *Waste disposal, *Governmental interrelations, *Administrative decisions. Pennsylvania, Sites, Local governments, State governments, Comprehensive planning, Administration, Planning, Judicial decisions, Legislation, Wastes, Management, Municipal wastes, Solid wastes, New York. Identifiers: Waste disposal sites, *New York City.

Plaintiff city challenged the authority of defendant Department of Environmental Resources to compel implementation of a regional solid waste management plan. Plaintiff and other cities submitted a plan to the defendant Department. The plan called for the creation of a solid waste refuse authority, and the vesting in it of responsibility to purchase and operate waste disposal sites. Sub-sequently, the plaintiff refused to implement certain portions of the plan which required delegation of powers to the authority. The Department issued orders seeking to compel compliance with the official plan, and plaintiffs contended that defendant Department lacks such authority under the Waste nagement Act. Adopting a liberal construction of the Act, designed to curtail health hazards and environmmental pollution by inadequate disposal practices, the court concluded that to leave implementation to the discretion of cities would frustrate the Act's objectives. Provisions were included in the Act for compelling compliance with sections calling for submission of an officially adopted plan. The court found that abandonment of official plans after approval would reduce the Act to an elaborate and expensive charade,

rendering fruitless the comprehensive planning contemplated by the legislature. (Molloy-Florida)

WATER RESOURCES COMMISSION V. CON-WATER RESOURCES COMMISSION V. COM-MECTICUT SAND AND STONE CORPORATION (JUDICIAL REVIEW OF ADMINISTRATIVE FACTUAL DETERMINATION). 364 A 2d 208-12 (Conn. 1975)

Descriptors: *Connecticut, *Sands, *Water pollu-tion control, *Administrative decisions, Adjudica-tion procedure, Decision making, Legislation, State governments, Dredging, Excavation, State governments, Dredging, Excavation, Gravels, Sediments, Pollutants, Pollution abatement, Legal aspects, Water quality, Water quality Identifiers: *Injunctive relief, Evidence.

Plaintiff Water Resources Commission sought injunctions compelling defendant polluter's com-pliance with orders to abate pollution. The Water Resources Commission is charged with enforcing statutes regulating, controlling and eliminating pollution of the waters of the state. The Commi determined that defendant was causing pollution, and ordered abatement of operations involving and ordered agatement of operations involving sandwashing and the dredging of sand and gravel. Defendant did not request a hearing, which was a prerequisite for judicial review. At trial for injunctions, defendant attempted to introduce factual evidence relating to its pollution and was not permitted to do so. The court held that failure to request an administrative hearing barred further factual determinations. The injunction was found to be mandated by statute and was therefore not dependant on the court's equity powers and rules. e contention that defendant may have stopped pollution was also judged irrelevant since the review was closed to factual determinations. The possibility of recurrence also indicates that the injunctions were proper since defendant's opera-tions were seasonal in nature. (Molloy-Florida) W77-08404

APPROPRIATION OF WATER Cal Water Code Ann secs 1200 thru 1271, 1375 thru 1485 (West 1971), as amended, (Supp 1976).

*California. Descriptors: *Appropriation, *Beneficial use, *Preferences(Water rights),
*Priorities, Water law, Legal aspects, Consumptive use, Domestic water, Municipal water, Irriga-*Preferences(Water rights), uve use, Lomesuc water, Municipal water, Irriga-tion water, State governments, Administrative agencies, Permits, Control, Legislation, Regula-tion, Governments, Social aspects, Reservoir storage, Public benefits. Identifiers: *Licenses, *Administrative regula-tions California Water Place

tions, California Water Plan.

California has statutorily provided that any unappropriated water may be appropriated for some useful or beneficial purpose. An administrative board has been created to issue permits and generally oversee the water appropriation system. Any person may apply for a water appropriation. permit provided he supplies the board with information concerning the amount of water desired and the uses to which it will be put. The board will consider and investigate all applications and determine whether a permit should or should not be granted in light of the public interest. The public is determined by reference to the California Water Plan (a long range outlook on water use in the state). An applicant who is rejected may appeal to a court of competent jurisdiction within a specified time. Permits granted remain valid so long as the water appropriated is used for a useful and beneficial purpose. If such water ceases to be used in the required manner for a period of three years, it reverts and is regarded as unappropriated public water. The board retains discretion to extend time periods when necessary. The statute explicitly grants municipalities and other public corporations priority in the acquisition of unap-propriated water. (Moorhouse-Florida) W77-08405

WATER DISTRICTS AND COMMISSIONERS. Wyo. Stat. Ann. secs. 41-61 thru 41-75 (1959), as amended (Supp. 1971).

Descriptors: *Wyoming, *Water districts, Streams, Reservoirs, *Ditches, Legislation, Administration, *Legal aspects, Regulation, Governments, Institutions, Stream stabilization, Stream erosion, Stream improvement, Streamflow, Reservoir operation, Water control, Water allocation(Policy), Water distribution(Applied), Water management(Applied), State governments, Water policy, Competing uses, Administrative agencies, Administrative decisions, Economic efficiency, Water rights. Water rights.
Identifiers: Headwates.

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The Wyoming Board of Control shall divide the state's stream systems into units called water districts in order to secure the best protection to the claimants for water, and the most economical supervision for the state. A water commissioner shall be appointed to divide, regulate and control the use of the water of all streams within his district, use of the water of all streams within his district, including regulating headgates to prevent waste. The Commissioner has the right to regulate the distribution of water among various users under any partnership or incorporated reservoir, or any partnership or incorporated ditch, and under the new amendments, any ditch held by joint owners not incorporated and not in partnership, where rights have been adjudicated in accordance with existing decrees. The amendments no longer require the Commissioner to take an oath, or file a bond. But should personal interests and prejudice arise, the Commissioner to take an oath, or file a bond. But should personal interests and prejudice arise, the Commissioner shall be disqualified and a substitute commissioner appointed to act in the matter in which the conflict of interest exists. All water commissioners, when on duty, shall make reports upon the request of the division superintendent. (Hadoulias-Florida)

GREAT SALT LAKE MANAGEMENT AND DEVELOPMENT.
Utah Code Ann. secs. 65-8a-1 thru -10 (Supp.

Descriptors: *Utah, *Great Salt Lake, *Administrative agencies, Legislation, Water con-servation, Administration, Governments, State servation, Administration, Governments, State governments, Local governments, Legal aspects, Regulation, Water law, Institutions, Water policy, Water resources, Recreation, Flood control, Wild dife conservation, Wildlife management, Industri-al production, Conservation, Adoption of prac-tices, Administrative decisions, Administrative costs, Allotments, Comprehensive planning, Deci-sion making, Project planning.

sion making, Project planning.

The Utah state legislature recognizes that the Great Salt Lake is a unique natural resource which requires a coordinated institutional arrangement utilizing existing county, state, and federal divisions and agencies in order to protect a balanced use of the resources. An appropriate institutional arrangement is necessary in order to establish and coordinate programs for the development of recreation areas, flood control, wildlife resources, industrial uses, and conservation of the Great Salt Lake. Therefore, a special division is created within the department of natural resources, and a Great Salt Lake board appointed. The twelvemember board shall have the power to establish policy and promulgate rules and regulations consistent with this Act. The division shall have the general responsibility for directing activities and implementing all plans regarding the lake. Other duties include fostering future water development, preparing comprehensive plans, supervising the lake flood plain, regulating waste dischargers, maintaining and creating recreational and wildlife areas, employing other assistants and advisers, handling fund disbursement and receipts, and performing all other acts reasonably necessary to carry out the purposes and provisions of the Act, thereby insuring proper management of Great Salt Lake. (Hadoulias-Florida) thereby insuring proper management of Great Salt Lake. (Hadoulias-Florida)

W77-08407

A POSTSCRIPT TO THE MUTUAL PRESCRIPTION DOCTRINE--CITY OF LOS ANGELES V CITY OF SAN FERNANDO,
J. N. Murdock.
Land and Water Law Review, Vol 11, p 131-146

(1976). 16 p, 57 ref.

Descriptors: *California, *Prescriptive rights, *Overdraft, *Water allocation(Policy), *Proration, Water rights, Groundwater, Legal aspects, Pumping, Water supply, Withdrawal, Water resources development, Water utilization, Cities, Watersheds(Basins), Water demand, Water requirements, Judicial decisions, Safe yield, Hydrologic data, Forecasting.

In 1949, the California Supreme Court established the mutual prescription doctrine in City of Pasadena v. City of Alhambra. This doctrine resulted in overdevelopment of California ground-water basins since it rewarded those users who ex-tracted more than their allocation by giving them tracted more than their allocation by giving them prescriptive rights against other users in proportion to the actual amount taken rather than the amount allotted. Therefore, it was in every user's best interest to overpump to keep from losing water. In 1975, the court reexamined the problem and adopted a new formula for allocation of groundwater in an overdrafted basin. The court established a stringent standard for notice of adgroundwater in an overdrafted basin. The court established a stringent standard for notice of adverse use and held that the exemption of municipalities from prescription was applicable to prescription of groundwater. The author suggests that this decision may remove the incentive for overdevelopment of California's groundwater the sains. He warns other states against applying a pro rata solution to overdrafting in light of the California experience since such a solution is likely to cause long term disruption due to the subsequent uncertainty of ownership of water rights. (Canehart-Florida) (Capehart-Florida) W77-08490

ALLOCATING BURIED TREASURE: FEDERAL LITIGATION INVOLVING INTERSTATE GROUND WATER,

W. P. Pendley. Land and Water Law Review, Vol 11, p 103-130 (1976). 28 p, 114 ref.

Descriptors: *Water management(Applied), *Groundwater, *Aquifer management, *State jurisdiction, *Equitable appointment, Prior appropriation, Reservation doctrine, Surface waters, Interstate rivers, Interstate compacts, Beneficial use, Federal government, State governments, Judicial decisions, Legal aspects, Riparian rights, Irrigation, Surface-groundwater relationships, Groundwater resources, Groundwater basins, Reasonable use, Water utilization.

Although groundwater is a water source which must be increasingly utilized in the future, no law has yet been developed for interstate groundwater rights and allocation. An examination of federal court decisions involving interstate surface waters is made here to determine their applicability to groundwater situations. The major problem is a jurisdictional one since a complaining state must meet a heavy burden of proof by showing that the threatened groundwater use poses serious danger. The cost of obtaining such evidence may well be prohibitive. A further requirement of showing real and substantial, rather than potential, harm could mean that litigation would be too late to prevent damage to groundwater basins. The development of a doctrine of equitable apportionment of groundwater must take into account the correlation between ground and surface water. The courts have not yet recognized such a correlation. have not yet recognized such a correlation. Although the interstate compact may be the most desirable solution to problems of interstate groundwater allocation, the most probable response is interstate litigation. (Capehart-Florida) W77-08491

6F. Nonstructural Alternatives

FEDERAL STATUTORY MODIFICATION OF PRIVATE WATER RIGHTS IN SOUTH FLORIDA.

Florida Univ., Gainesville. School of Lav For primary bibliographic entry see Field 6E. W77-08112

WATER RESOURCE POLICIES AND AUTHORITIES, COASTAL ZONE MANAGE-MENT PROGRAM IMPLEMENTATION, Corps of Engineers, Washington, D.C. For primary bibliographic entry see Field 6E. W77-08114

BEAR RIVER COMPACT, For primary bibliographic entry see Field 6E. W77-08155

FINAL REPORT OF COMMITTEE VII (FINAL RECOMMENDATIONS OF THE INTERNATIONAL CONFERENCE ON WATER LAW AND ADMINISTRATION),

For primary bibliographic entry see Field 6E. W77-08187

FLOOD MANAGEMENT: WHO BENEFITS AND

WHO PAYS, Massachusetts University, Amherst. Dept. of Food and Resource Economics. J. H. Foster.

Water Resources Bulletin, Vol. 12, No. 5, October 1976, p. 1029-1039, 1 tab, 3 ref. OWRT B-028-MASS(7), 14-31-0001-3896.

Descriptors: *Cost-benefit analysis, Alternative costs, *Flood protection, *Flood control, *Alternative planning, Flood plain insurance, Land use, Flood plain zoning, Planning, Management, Floodproofing.

Identifiers: *Flood management.

The distribution of costs and benefits among groups in society of alternative flood management actions is examined in terms of their final incidence or resting place—their influence on real estate values. The alternatives examined include structures, disaster relief, floodproofing, watershed land treatment, floodplain zoning, and flood invarions. The impact of each alternative on flood insurance. The impact of each alternative on the amount of flood disability cost paid by the lan-downer is examined and variations among alterna-tives are used to explain the past political success of structures and reliefs as compared to zoning, floodproofing, and insurance. (Lefferts-Massachusetts) W77-08303

FLOOD PLAINS FOR OPEN SPACE AND RECREATION.

Bureau of Outdoor Recreation, Washington, D. C. For sale by Supt of Documents, US Govt Printing Office Washington, D.C. 20402. Price \$1.10 (single copy). Outdoor Recreation Action, No 39, p 3-16. 24 photo. (1976).

Descriptors: *Recreation, *Flood control, *Rivers, *Flood plains, Land use, Reservoir operation, Recreation facilities, Reservoirs, Parks, Dams, Flood damage, Water policy, River basin development, Floodways, Flood protection, Flood plain insurance, Non-structural alternatives, Watershed management.

Identifiers: *Water Resources Development Act, *Land and Water Conservation Fund Program.

The flood plain is nature's arrangement for periodic flood storage and discharge. Exceptional flooding conditions will eventually cause a stream to reclaim its flood plain regardless of what structures man has placed there. Extensive flood

Group 6F-Nonstructural Alternatives

damages to residential and business areas throughout the United States, in the early 1970s resulted in a National Forum on 'The Future of the Flood Plain' held in 1975. Participants in the Forum, including the Bureau of Outdoor Recrea-tion, the US Army Corps of Engineers, The League of Women Voters, and the National Association of Counties, made 50 or more recom-mendations on flood plain management. Among these recommendations were: a call for a statethese recommendations were: a call for a state-ment of national policy, with criteria for state and local governments to use in planning; identifica-tion of critical areas and long-term management plans; expansion of technical assistance in flood plain management; passage of flood plain zoning and standards; and purchase of flood plains when necessary. In many areas of the United States, programs have been implemented which combine flood control projects with outdoor recreation, utilizing non-structural alternatives to development of the flood plain, such as parks, bikeways, courses, and playgrounds The article describes typical programs in various states. (Sloan-Florida) W77-08374

6G. Ecologic Impact Of Water Development

COMPUTERIZED PLANNING SYSTEM FOR NUCLEAR POWER PLANT EVALUATION, Krannert Graduate School of Management, Lafayette, Ind. For primary bibliographic entry see Field 6B. W77-08108

DISCRIMINANT ANALYSIS OF CHARACTERISTICS DETERMINING ACCEPTANCE OR REJECTION OF NUCLEAR POWER,
Krannert Graduate School of Management, LaFayette, Ind. For primary bibliographic entry see Field 6B. W77-08109

U.S. ENVIRONMENTAL PROTECTION AGEN-CY ENVIRONMENTAL RESEARCH OUTLOOK FY 1976 THROUGH 1980 (REPORT TO CON-GRESS).

Environmental Protection Agency, Washington, D.C. Office of Research and Development. Available from the National Technical Informaroyanore from the National Technical Information Service, Springfield, VA 22161 as PB-250 523, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/9-76-003, February 1976. 158 p, 2 fig. 18 photo, 7 tab, 1 append.

*Federal Descriptors: government, **Comprehensive planning, *Administrative agencies, *Environmental effects, Future planning(Projected), *Research and development, *Research priorities, Waste water treatment, In-dustrial production, Planning, Water pollution sources, Pollution abatement, Governmental interrelations, Industrial wastes, Public health, Water pollution control, Water quality control.

The Office of Research and Development (ORD) was created to conduct a comprehensive and inwas created to conduct a comprehensive and integrated research program for the Environmental Protection Agency (EPA). In a report on the first five year Research Plan, ORD describes research, priorities and trends for the fiscal years 1976-1980. The report covers ORD's five major programs: Health and Ecological Effects, Industrial Processes, Public Sector Activities, Monitoring and Technical Support, and Energy/Environment. Research for developing and improving criteria for pollution control in freshwater systems, and the assessment of progress in marine and estuarine assessment of progress in marine and estuarine systems is emphasized. The setting of standards systems is emphasized. The setting of standards for industrial pollution control requires examination of all media, air, water and land, in order to avoid merely transferring pollution impacts from one medium to another. Increased attention will be

given to methods to improve the performance and reduce the cost of waste water treatment systems. Priority is placed on the Health and Industrial Processes programs. Monitoring of pollution sources and agreements with other federal agencies are also described. Increased pollution sources and agreements with other federal agencies are also described. Increased pollution control technology is needed in the industrial arena if the (Molloy-Florida)
W77-08120

ENVIRONMENTAL PROTECTION THROUGH THE COMMON LAW, Calgary Univ. (Alberta). Faculty of Environmental

Western Ontario L Rev, Vol 12, p 107-71 (1973).

Descriptors: *Common law, *Pollution abatement, *Water pollution control, *Legal aspects, Water *Negligence, *Trespass, Hazards, Penalties(Legal), Remedies, Riparian land, Riparian rights, Water rights, Prescriptive rights, Industries, Control, Governments, Legal review, Judi-

Identifiers: *Nuisance(Legal aspects). *Injunctions(Prohibitory), Absolute liability, Evidence, Intentional torts, Standing(Legal), Statute of limitations.

The explosion of ecological publications and the extensive media coverage has convinced everyone that an environmental crisis exists. Government and industry both have attempted to alleviate the problem and both have been, for the most part, unsuccessful. One avenue of pollution abatement that has been little used is the ordinary common law. Private persons can maintain actions against polluters based upon trespass, negligence and ultrahazardous activities. However, the conservative drawbacks of the common law often make such attempts fruitless. The procedural drawbacks of expert witnesses, funds, time, problems of proof and the requirement of a private property interest should be analyzed and radically redesigned. Substantively, the causes of action themselves should be liberalized. A suit in nuisance should be permitted for an interference with a private right despite the fact that the individual has suffered no particular, direct, and substantial damage. The law of riparian rights should allow an injunction enjoining any pollution whatever without requiring any proof of actual damage to property. Defendants should be barred from claiming any prescriptive right to pollute even though their action may have existed for the requisite period of time. In the absence of extraordinary circumstances, an in-junction against pollution should be issued immediately, ignoring the balancing of conveniences. (Moorhouse-Florida) W77-08133

SIERRA CLUB V STAMM (NATIONAL EN-VIRONMENTAL POLICY ACT DOES NOT REQUIRE COMPREHENSIVE ENVIRONMEN-TAL IMPACT STATEMENT ON LARGE RECLAMATION PROJECT WHEN EIS HAVE BEEN PREPARED FOR VIABLE PORTION OF

For primary bibliographic entry see Field 6E. W77-08147

NATURAL RESOURCES DEFENSE COUNCIL V STAMM (NATIONAL ENVIRONMENTAL POL-ICY ACT NOT SATISFIED WHEN EIS FAILS TO DISCUSS ALL REASONABLE ALTERNATIVES TO THE PROJECT).

For primary bibliographic entry see Field 6E. W77-08148

SUMMARY OF SOME CURRENT AND POSSIBLE FUTURE ENVIRONMENTAL PROBLEMS RELATED TO GEOLOGY AND HYDROLOGY AT MEMPHIS, TENNESSEE, Geological Survey, Nashville, Tenn. Water

Resources Div. For primary bibliographic entry see Field 4C. W77-08174

NEW WATER LEGISLATION-DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION, Wyoming Univ., Laramie. Coll. of Law. For primary bibliographic entry see Field 6E. W77-08188

PUMPED STORAGE POTENTIAL OF THE HELLS CANYON AREA, Idaho Univ., Moscow. Dept. of Civil Engineering.

For primary bibliographic entry see Field 8C. W77-08196

CHANNELIZATION: ENVIRONMENTAL, GEOMORPHIC AND ENGINEERING ASPECTS, North Carolina Univ. at Charlotte. Dept. of Geography and Earth Science. For primary bibliographic entry see Field 8D.

THE ENVIRONMENTAL PROBLEM OF THE OCEANS: AN INTERNATIONAL STEPCHILD OF NATIONAL EGOTISM.

For primary bibliographic entry see Field 6E. W77-08367

EMERGING LEGAL CONCEPTS IN THE HAR-MONIZATION OF WATER RESOURCES DEVELOPMENT AND ENVIRONMENTAL PROTECTION,

Fordham Univ., N.Y. School of Law For primary bibliographic entry see Field 6E. W77-08378

OF **ENGINEERS** STATE CORPS (COST/BENEFIT ANALYSIS UNDER NEPA AND THE FLOOD CONTROL ACT). For primary bibliographic entry see Field 6E. W77-08400

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WATER QUALITY IMPACTS OF URBANIZA-TION-A METHODOLOGY, Economic and Social Commission for Asia and the

Pacific (UN), Bangkok (Thailand). Div. of Indus-try, Housing, and Technology. For primary bibliographic entry see Field 5B. W77-08514

7. RESOURCES DATA

7A. Network Design

ON THE RELATIONSHIP BETWEEN THE FINITE ELEMENT AND FINITE DIFFERENCE

Geological Survey, Trenton, N.J. Water Resources Div.

W. G. Gray, and G. F. Pinder.
International Journal for Numerical Methods in Engineering, Vol 10, p 893-923, 1976. 9 tab, 5 ref.

*Finite *Convection, *Diffusion, *Equations, Analytical techniques, Evaluation. *Galerkin-finite element method, Identifiers: *Finite difference method.

The integral equations which arise from applica-tion of the Galerkin-finite element scheme to the

convective-diffusion equation are examined to ilconvective-diffusion equation are examined to in-lustrate how this method represents differential equations. The formulae obtained are effectively spatial averages of standard finite difference equa-tions written at a node. the truncation error in the finite element solution at a node is obtained for various nodal configurations. (Woodard-USGS) W77-08168

THE OPERATION OF A FLOOD WARNING NETWORK: ITS USE FOR STUDYING FLASH FLOODS (EXPLOITATION D'UN RESEAU P'ALERTE: SON UTILISATION POUR L'ETUDE DES CRUES BRUTALES), Division des Resources en Eau, Tunis (Tunisia). For primary bibliographic entry see Field 2E. W77-08248

DESIGN OF A WATER QUALITY MONITOR-ING NETWORK, North Carolina Univ. at Chapel Hill. Dept. of En-vironmental Sciences and Engineering. For primary bibliographic entry see Field 5A. W77-08497

7B. Data Acquisition

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MEASUREMENT OF FLASH FLOODS IN THE UNITED STATES-STATE OF THE ART, Geological Survey, Reston, Va. Water Resources For primary bibliographic entry see Field 2E. W77-08161

ON THE RELATIONSHIP BETWEEN THE FINITE ELEMENT AND FINITE DIFFERENCE Geological Survey, Trenton, N.J. Water Resources Div. For primary bibliographic entry see Field 7A. W77-08168

INVESTIGATION OF DETECTION LIMITS FOR SOLUTES IN WATER MEASURED BY LASER RAMAN SPECTROMETRY, Smithsonian Institution, Washington, D.C.; and Geological Survey, Lakewood, Colo. Water Paragraphs 19 Resources Div. For primary bibliographic entry see Field 2K. W77-08171

DELINEATION OF DECIDUOUS WETLAND FORESTS IN NORTHEASTERN CONNEC-Connecticut Univ., Storrs. Inst. of Water Resources. For primary bibliographic entry see Field 2G. W77-08194

RELATIVE REFLECTANCE AND COMPLEX REFRACTIVE INDEX IN THE INFRARED FOR SALINE ENVIRONMENTAL WATERS, Missouri Univ.-Kansas City. Dept. of Physics. For primary bibliographic entry see Field 2L. W77-08215

VERTICAL STRAIN-RATE MEASUREMENTS IN AN ARCTIC ICE CAP AND DEDUCTIONS FROM THEM, Department of Energy, Mines, and Resources, Otawa (Ontario). Polar Continental Shelf Project. For primary bibliographic entry see Field 2C. W77-08226

A FURTHER COMPARISON OF GLACIER VELOCITIES MEASURED BY RADIO-ECHO AND SURVEY METHODS, British Antarctic Survey, Cambridge (England). For primary bibliographic entry see Field 2C.

W77-08228

RADIO-ECHO SOUNDING OF TEMPERATE GLACIERS: ICE PROPERTIES AND SOUNDER DESIGN CRITERIA, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 2C.

RADIO-ECHO SOUNDING: REFLECTIONS FROM INTERNAL LAYERS IN ICE SHEETS, Wisconsin Univ. Middleton. Geophysical and Polar Research Center. For primary bibliographic entry see Field 2C. W77-08230

MEASUREMENT OF ICE MOVEMENT IN SUB-GLACIAL CAVITIES: A NEW CAVITOMETER BENEATH THE GLACIER D'ARGENTIERE (MT BLANC, FRANCE), Grenoble-1 Univ. (France). Institut de Geographie

For primary bibliographic entry see Field 2C. W77-08238

ON DEPTH HOAR AND THE STRENGTH OF Montana State Univ., Bozeman. Dept. of Earth For primary bibliographic entry see Field 2C. W77-08239

RELOCATION OF BURIED MARKERS, British Columbia Univ., Vancouver. Dept. of Geological Sciences.

For primary bibliographic entry see Field 2C. W77-08240

APPLICATIONS OF SURFACE RESISTIVITY Alberta Univ., Edmonton. Dept. of Geology. For primary bibliographic entry see Field 2F. W77-08244

A METHODOLOGY FOR MEASURING FLASH FLOODS (METHODOLOGIE POUR LA ME-SURE DES CRUES BRUTALES), Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). For primary bibliographic entry see Field 2E. W77-08249

THERMAL SENSOR FOR MEASUREMENT OF OCEAN CURRENT DIRECTION, Office of the Secretary (Navy), Washington, D.C. For primary bibliographic entry see Field 2L. W77-08257

DETERMINING AREAL PRECIPITATION IN THE BASIN AND RANGE PROVINCE OF SOUTHERN ARIZONA - SONOITA CREEK Arizona Water Resources Research Center, Tuc-

For primary bibliographic entry see Field 2B. W77-08308

TRUE-TEMPERATURE DETERMINATION OF GEOTHERMAL RESERVOIRS, Texas Instruments, Inc., Dallas, Tex. Geoexploration, Vol 15, No 1, p 1-9, January, 1977, 16 ref.

Descriptors: *Geothermal studies, *Thermal water, *Water temperature, *Resistivity, Electrical studies, Electronic equipment, Porous media, Saline water, Electrolytes. Identifiers: *Geothermal *Temperature measurement.

Dwindling supplies of hydrocarbon resources and Dwindling supplies of hydrocarbon resources and the many advantages of utilizing terrestrial heat for power generation have sparked intense new in-terest in geothermal reservoir development. Several techniques are curently being used to determine the extent of geothermal fields, and the electrical resistivity method has proved to be one of the most effective. It is also possible to measure the temperature of geothermal reservoirs via re-sistivity surveys. The following formula explicitly gives the temperature of a geothermal reservoir. gives the temperature of a geothermal reservoir: t sub h = t sub c + (1/alpha) ((rho sub c/rho sub h)-1). T sub h and rho sub h are, respectively, the temperature and resistivity of the hot portion of the earth, i.e., the reservoir; t sub c and rho sub c are, respectively, the temperature and resistivity of the cold (surface) portion of the earth, and alpha is the temperature coefficient of resistivity of the ground water in the area under question Rho sub c and rho sub h are calculated from resistivity survey field data while alpha is deter-mined by laboratory measurements. Experimentation is still necessary, however, before this formula can be assumed valid for geothermal fields of very high temperatures (300 C and up). (Eberle-NWWA) W77-08318

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, VOLUME I-A, TECHNICAL SESSION PRESENTATIONS, AGRICULTURE-ENVIRON-MENT.

National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center. Available from the National Technical Informa-tion Service, Springfeild, VA 22161 as N76-17588, Price codes: A23 in paper copy, A01 in microfiche. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, September 1975 (3 Vol.), 595 p. Smistad, O., Coordinator.

Descriptors: *Conferences, *Remote sensing, *Agriculture, *Environment, Satellites(Artificial), Land use, Water quality, Mapping, Range management, Land management, Marshes, Wetlands, Data processing, Monitoring, Forests, Vegetation, Revegetation, Resources, Land resources. Identifiers: *LANDSAT, Skylab.

The reported symposium combined with utilization and results of data from NASA programs in-volving LANDSAT, the Skylab Earth resources experiment package, and aircraft, as well as information from other data acquisition programs. The primary emphasis was on the practical applications of Earth resources survey technology, which is of interest to a large number of potential users. Also featured were scientific and technological exploration and research investigations with poten-tial promising applications. Technical sessions were structured to provide governmental and private organizations with a comprehensive picture of various applications in the management and implementation of remote-sensing data use in their own programs. Volume I-A contained techni-cal papers related to agriculture and environment. (See W77-08409 thru W77-08438) (Humphreys-ISWS) W77-08408

ESTIMATING VEGETATIVE BIOMASS FROM LANDSAT-1 IMAGERY FOR RANGE MANAGE-

Nebraska Univ., Lincoln. Conservation Survey Div. For primary bibliographic entry see Field 4A. W77-08409

Field 7-RESOURCES DATA

Group 7B-Data Acquisition

DISCRIMINATING COASTAL RANGELAND PRODUCTION AND IMPROVEMENTS WITH COMPUTER AIDED TECHNIQUES, Lockheed Electronics Co., Inc., Houston, Tex.

Aerospace Systems Div. For primary bibliographic entry see Field 4A. W77-08410

USEFULNESS OF LANDSAT DATA FOR MONI-TORING PLANT DEVELOPMENT AND RANGE CONDITIONS IN CALIFORNIA'S ANNUAL CRASSLAND.

Geological Survey, Sioux Falls, S. Dak. EROS Data Center.

For primary bibliographic entry see Field 4A. W77-08411

MONITORING VEGETATION CONDITIONS FROM LANDSAT FOR USE IN RANGE MANAGEMENT

Texas A and M Univ., College Station. For primary bibliographic entry see Field 4A. W77-08412

UTILIZATION OF LANDSAT IMAGERY FOR MAPPING VEGETATION ON THE MILLIONTH

Kansas Univ., Lawrence, Space Technology Labs

For primary bibliographic entry see Field 7C. W77-08413

LANDSAT-1 DATA, ITS USE IN A SOIL SUR-VEY PROGRAM.

South Dakota State Univ., Brookings. Dept. of Plant Science; and South Dakota State Univ., Brookings. Remote Sensing Inst. For primary bibliographic entry see Field 2G. W77-08414

DELINEATION OF THE BOUNDARIES OF A BURIED PRE-GLACIAL VALLEY WITH LAND-SAT-1 DATA, Purdue Univ., Lafayette, Ind.

For primary bibliographic entry see Field 2G. W77-08415

ARE CLEAR-CUT AREAS ESTIMATED FROM LANDSAT IMAGERY RELIABLE, Pacific Forest Research Centre, Victoria (British Columbia).

For primary bibliographic entry see Field 4A. W77-08416

OPERATIONAL CONSIDERATIONS FOR THE APPLICATION OF REMOTELY SENSED FOREST DATA FROM LANDSAT OR OTHER AIRBORNE PLATFORMS, Saint Regis Paper Co., Jacksonville, Fla. Southern

Timberlands Div.

For primary bibliographic entry see Field 7C. W77-08417

TYPE SEPARABILITY SOUTHEASTERN UNITED STATES ON LAND-SAT-1 MSS DATA.

Lockheed Electronics Co., Inc. Houston, Tex. For primary bibliographic entry see Field 4A. W77-08418

MAPPING OF THE WILDLAND FUEL CHARACTERISTICS OF THE SANTA MONICA MOUNTAINS OF SOUTHERN CALIFORNIA, ESL, Inc., Sunnyvale, Calif. Earth Resources Technology Applications.
For primary bibliographic entry see Field 7C.

COMPUTER ANALYSIS AND MAPPING OF GYPSY MOTH DEFOLIATION LEVELS IN PENNSYLVANIA USING LANDSAT-1 DIGITAL

National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center. For primary bibliographic entry see Field 7C. W77-08420

COMPUTER IMPLEMENTED CLASSIFICA-TION OF VEGETATION USING AIRCRAFT ACQUIRED MULTISPECTRAL SCANNER ACQUIRED

DATA, National Aeronautics and Space Administration, Bay Saint Louis, Miss. Earth Resources Lab. For primary bibliographic entry see Field 4A. W77-08421

THE USE OF SKYLAB DATA TO STUDY THE EARLY DETECTION OF INSECT INFESTA-TIONS AND DENSITY AND DISTRIBUTION OF HOST PLANTS.

Agricultural Research Service, Weslaco, Tex. Southern Region Citrus Insects Research. For primary bibliographic entry see Field 7C. W77-08422

AGRICULTURAL INVENTORY CAPABILITIES PROCESSED MACHINE LANDSAT DIGITAL DATA, General Electric Co., Beltsville, Md. Space

Systems Organization.
For primary bibliographic entry see Field 3F.

APPLICATIONS AGRICULTURAL OF REMOTE SENSING--A TRUE LIFE ADVEN-

General Electric Co., Beltsville, Md. For primary bibliographic entry see Field 3F. W77-08424

PRACTICAL APPLICATION OF REMOTE SENSING IN AGRICULTURE,

Anderson, Clayton and Co., Houston, Tex. For primary bibliographic entry see Field 3F. W77-08425

WILDLIFE MANAGEMENT BY HABITAT UNITS--A PRELIMINARY PLAN OF ACTION, For primary bibliographic entry see Field 4A. W77-08426

AN OVERVIEW OF THE DEVELOPMENT OF REMOTE SENSING TECHNIQUES FOR THE SCREWWORM ERADICATION PROGRAM, National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center. For primary bibliographic entry see Field 3F. W77-08427

THE RATIONALE FOR ATTEMPTING TO DEFINE SALT MARSH MOSQUITO-BREEDING AREAS IN GALVESTON COUNTY REMOTE SENSING THE ASSOCIATED VEGETATION.

Lockheed Electronics Co., Houston, Tex. For primary bibliographic entry see Field 4A.

APPLICATION OF EREP, LANDSAT AND AIR-CRAFT IMAGE DATA TO ENVIRONMENTAL PROBLEMS RELATED TO COAL MINING, Earth Satellite Corp. Washington, D. C. For primary bibliographic entry see Field 5A.

QUANTITATIVE WATER QUALITY WITH LANDSAT AND SKYLAB. Kansas Univ., Lawrence.

For primary bibliographic entry see Field 5A. W77-08431

LANDSAT-1 DATA AS IT HAS BEEN APPLIED FOR LAND USE AND WATER QUALITY DATA BY THE VIRGINIA STATE WATER CONTROL BOARD, Virginia State Water Control Board, Richmond.

Div. of Surveillance and Field Studies. For primary bibliographic entry see Field 5A. W77-08432

THE LANDSAT-1 MULTISPECTRAL SCANNER AS A TOOL IN THE CLASSIFICATION OF IN-LAND LAKES.

National Eutrophication Survey, Corvallis, Oreg. For primary bibliographic entry see Field 5A. W77-08433

TROPHIC STATUS OF INLAND LAKES FROM LANDSAT

Wisconsin Univ., Madison, Inst. for Environmental Studies.

For primary bibliographic entry see Field 5A. W77-08434

THE USE OF LANDSAT-1 IMAGERY FOR WATER QUALITY STUDIES IN SOUTHERN

Lund Univ., (Sweden). Dept. of Physical Geog-For primary bibliographic entry see Field 5A. W77-08435

A COMPARATIVE INTERREGIONAL ANALY-SIS OF SELECTED DATA FROM LANDSAT-1 AND EREP FOR THE INVENTORY AND MONITORING OF NATURAL ECOSYSTEMS, Earth Satellite Corp., Berkeley, Calif. For primary bibliographic entry see Field 7C.

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W77-08438

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REMOTE SENSING APPLICATIONS IN KAN-

Kansas Univ., Lawrence, Space Technology Labs.

For primary bibliographic entry see Field 4A. W77-08437

REMOTE SENSING APPLICATIONS IN THE INVENTORY AND ANALYSIS OF ENVIRON-MENTAL PROBLEMS,
Environmental Protection Agency, Warrenton,

Va. Environmental Photographic Interpretation For primary bibliographic entry see Field 5A.

A CONTROLLABLE AUTOMATED ENVIRON-MENTAL DATA ACQUISITION AND MONITORING SYSTEM, Brookhaven National Lab., Upton, N. Y.

For primary bibliographic entry see Field 7C. W77-08441

INVERTEBRATE COLONIZATION OF ARTIFI-CIAL SUBSTRATES IN SAN LEANDRO CREEK,
California Univ., Berkeley. Dept. of Forestry and

Conservation For primary bibliographic entry see Field 5A. W77-08443

7C. Evaluation, Processing and Publication

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COMPUTERIZED PLANNING SYSTEM FOR NUCLEAR POWER PLANT EVALUATION, Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6B. W77-08108

CONTINUOUS AUTOMATED MONITORING OF CHEMICAL AND PHYSICAL CHARACTERISTICS OF THE RED CEDAR RIVER, Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife. For primary bibliographic entry see Field 5A. W77-08110

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1975, Geological Survey, Indianapolis, Ind. Water Resources Div.

Resources Div.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 859, Price codes: A16 in paper copy, A01 in microfiche.

Water-Data Report IN-75-1, March 1976. 355 p, 3 fig. 22 ref

Descriptors: *Indiana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reervoirs, Water wells, Water levels, Sampling, Sites.

Identifiers: Annual State report(Ind).

Water resources data for the 1975 water year for Indiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 182 gaging stations; and water levels for 15 observation wells. Partial-record stations include 104 crest stage, 52 low flow, and 20 low and high flow. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Indiana. (Woodard-USGS) W77-08162

SELECTED WATER-LEVEL RECORDS FOR WESTERN OKLAHOMA, 1950-1975, Geological Survey, Oklahoma City, Okla. Water

Geological Survey, Oklahoma City, Okla. Water Resources Div. R. L. Goemaat.

Open-File report 77-73, January 1977. 94 p, 1 fig, 1 tab.

Descriptors: *Groundwater, *Water wells, *Water levels, *Water level fluctuations, *Oklahoma, Basic data collections, Irrigation, Observation wells, Aquifers, Groundwater availability. Identifiers: Western Oklahoma.

Ground-water-level measurements and water level changes are presented for about 900 wells in 19 counties of western Oklahoma where ground water is heavily used for irrigation. Measurements made in major aquifers of the area including the Ogalalla Formation, rush Springs Sandstone, Blaine Gypsum, Cimarron terrace, and Tillman terrace. The data are subdivided by counties. (Woodard-USGS) W77.0816-1

GROUND-WATER DATA FOR 1974-75 IN JOSHUA TREE NATIONAL MONUMENT, CALIFORNIA,

Geological Survey, Menlo Park, calif. Water Resources Div.

D. J. Downing. Open-File report 77-80, January 1977. 34 p, 2 fig, 4 tab, 3 ref.

Descriptors: *Groundwater, *Water levels, *Water quality, *Water wells, *Water yield, Pumping, Basic data collections, Observation wells, California, National Parks.

Identifiers: *Joshua Tree National Monument(Calif).

This report, prepared at the request of the National Park Service, is part of a continuing inventory by the U.S. Geological Survey of general geohydrologic conditions at Joshua Tree National Monument, California. Tables of data for 1974-75 includes chemical analyses of ground water from selected wells and pumpage by Kaiser Steel Corporation from Pinto Basin. The table for yearly pumpage totals by Kaiser Steel Corporation includes years 1960-75. Water-level measurements are included for 22 observation wells. (Woodard-USGS)

SUBSURFACE-TEMPERATURE DATA FOR SOME WELLS IN WESTERN UTAH, Geological Survey, Salt Lake City, Utah. Water Resources Div. F E Puch.

Open-File Report 77-132, January 1977. 84 p, 1 fig, 1 tab.

*Geothermal studies, *Wells, *Utah, *Temperature, Measurement, Methodology, Depth, Data collections, Sites. Identifiers: *Electronic thermometer.

This hydrothermal reconnaissance of the State of Utah contains temperature-profile data for 30 wells. Most of the wells were small-diameter geothermal-exploration wells. Some were stock, domestic, or irrigation wells. Temperatures were measured using thermistor, 4-conductor cable, and a digital multimeter. Meter readings were in ohms, but were converted to temperature by a calibration graph. The electronic thermometer is capable of an accuracy to 0.01 deg C, and the highest temperature measured was 107.80 deg C in the only well to have measurements of 100 deg C or higher. Because of variations in field conditions, the temperature data in many wells probably is accurate only to 0.1 deg C. Depths below land surface were measured using a sheave and attached counter. (Woodard-USGS)

GEOHYDROLOGY OF THE ENGLISHTOWN FORMATION IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,

Geological Survey, Trenton, N.J. Water Resources Div. For primary bibliographic entry see Field 2F. W77-08175

GROUND-WATER BASIC DATA FOR RAMSEY COUNTY, NORTH DAKOTA, Geological Survey, Bismarck, N. Dak. Water

Resources Div.

R. D. Hutchinson.

N. D. Futtermoon. North Dakota County Ground-Water Studies 26-Part II, and North Dakota Geological Survey Bulletin 71-Part II, Bismarck, N.D., 1977. 344 p, 2 fig, 1 plate, 5 tab, 25 ref, append.

Descriptors: "Hydrologic data, "Groundwater resources, "Aquifer characteristics, "Well data, "Water quality, Water levels, Hydrogeology, Drillers logs, Test wells, Water yield, Chemical analysis, North Dakota. Identifiers: "Ramsey County(N Dak).

This report contains basic data for 1,145 wells and test holes in Ramsey County, North Dakota. In-

cluded are 452 logs of test holes and wells, 209 chemical analyses of water samples, and water-level measurements in 73 observation wells. The purpose of the investigation was to provide detailed geologic and hydrologic information needed for the orderly development of water supplies for municipal, domestic, livestock, irrigation, industrial, and similar uses. Specifically, the objectives were to: (1) determine the location, extent, and nature of the major aquifers and confining beds; (2) evaluate the occurrence and movement of ground water, including the sources of recharge and discharge; (3) estimate the potential yields of wells; (4) evaluate the quality of the ground water; and (5) estimate the water use. (Woodard-USGS)

DATA FOR CALIBRATING UNSTEADY-FLOW SEDIMENT-TRANSPORT MODELS, EAST FORK RIVER, WYOMING, 1975, Geological Survey, Lakewood, Colo. Water Resources Div. H. A. Mahonev, E. D. Andrews, W. W. Emmett,

H. A. Mahoney, E. D. Andrews, W. W. Emmett, L. B. Leopold, and R. H. Meade. Open-File Report 76-22, December 1976. 293 p., 12 fig. 39 tab, 10 ref.

Descriptors: *Sediment transport, *Unsteady flow, *Alluvial channels, *Channel morphology, *Mathematical models, Data collections, Evaluation, Bed load, Particle size, Cross-sections, Stage-discharge relations, Streamflow, Flow rates, Sediment yield, *Wyoming, Identifiers: *East Fork River(Wyo).

In 1975, data to calibrate a one-dimensional unsteady-flow and sediment-transport routing model were collected on a reach of the East Fork River of western Wyoming. The reach, 3.1 miles in length, was immediately upstream from a previously established bedload sampling station. Nineteen channel cross sections were sounded at regular intervals during the spring-runoff period. Four stage recorders provided continuous records of water-surface elevations. Samples of bed material at most of the cross sections were obtaind prior to high water. Streamflow and sediment-discharge measurements were collected at four of the sections. The physiography and hydrology of the contributing watershed, the study reach, and the equipment and techniques used in data collection are described. The bulk of the report is a presentation of data for late May to early June 1975, for which concurrent water discharge data, bedload transport and size data, and cross-section depth measurements were collected. In addition, some data collected in 1973 and 1974 and before and after the calibration period in 1975 are included. (Woodard-USGS)

SELECTED HYDROLOGIC DATA, UINTA BASIN AREA, UTAH AND COLORADO, Geological Survey, Salt Lake City, Utah. Water Resources Div.

Resources Div.
J. W. Hood, J. C. Mundorff, and D. Price.
Utah Basic-Data Release No 26, Salt Lake City,
1976. 321 p, 9 fig, 2 plates, 15 tab, 19 ref.

Descriptors: *Hydrologic data, *Utah, *Colorado, *Water resources, *Water quality, Basic data collections, Surface waters, Groundwater, Observation wells, Well data, Aquifers, Water levels, Streamflow, Flow rates, Chemical analysis. Identifiers: *Uinta Basin area (Utah and Colo).

The Uinta Basin area in northeastern Utah and northwestern Colorado covers an area of slightly more than 10,000 sq mi. More than 95 percent of the basin is in Utah, thus most of the data in this report apply to Utah. Selected data are consolidated from available records of water wells, springs, petroleum-test wells, and streams. Included are well logs, laboratory analyses of grainsize distribution and hydrologic properties of

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

aquifer samples, water levels in observation wells. stream discharge, and water-quality records for all types of water sources. (Woodard-USGS) W77-08183

WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1975,

WATER YEAR 1975, Geological Survey, Champaign, Ill. Water Resources Div. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-254 434, Price codes: A12 in paper copy, A01 in microfiche. Water-Data Report IL-75-1, April 1976. 408 p, 4 fig, 4 tab, 29 ref

Descriptors: *Illinois, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling,

Water resources data for the 1975 water year for Illinois consist of records of stage, discharge, and water quality of wells. This report contains discharge records for 174 gaging stations; stage only records for 5 gaging stations; stage and contents for 3 lakes and reservoirs; stage only for 5 lake stations; water quality for 41 gaging stations; and water levels for 3 observation wells. Also included are data for 148 crest-stage partial-record stations and 251 flood-profile stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Suurvey and cooperating State and Federal agencies in Illinois. (Woodard-USGS)

WATER RESOURCES DATA FOR NEVADA,

WATER YEAR 1975, Geological Survey, Carson City. Nev. Water Resources Div.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-254 431, Price codes: A14 in paper copy, A01 in microfiche. Water-Data Report NV-75-1, March 1976. 292 p, 8 fig. 4 tab. 35 ref.

Descriptors: *Nevada, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites.

Water resources data for the 1975 water year for Nevada Consists of records of discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 120 gaging stations; stage and contents for 21 lakes and reservoirs; water-quality data for continuing-record stations at 23 stream sites and for partial-record stations at 5 stream sites and 2 lake sites; and water levels for 62 observation wells. Also included are 121 crest-stage partialrecord stations and 13 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Nevada. (Woodard-USGS) W77-08185

EFFECT OF DIP ON THE SUBSURFACE STORAGE OR DISPOSAL OF FLUID IN SALINE AQUIFERS,

Louisiana Water Resources Research Inst., Baton Rouge.

For primary bibliographic entry see Field 4B. W77-08204

EFFECT OF VISCOSITY RATIO ON THE RECOVERY OF FRESH WATER STORED IN SALINE AQUIFERS, Louisiana State Univ., Baton Rouge. Dept. of

Petroleum Engineering.
For primary bibliographic entry see Field 4B.
W77-08205

THE AFGWC SNOW COVER ANALYSIS MODEL. Air Force Global Weather Central, Offutt AFB,

Nebr. For primary bibliographic entry see Field 2C. W77-08223

PUMPED-STORAGE IN THE NORTHWEST, AN INVENTORY. Corps of Engineers, Portland, Oreg. North Pacific

For primary bibliographic entry see Field 2H. W77-08224

RESURVEY OF THE 'BYRD' STATION, ANTARCTICA, DRILL HOLE,

Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 2C. W77-08227

COMPUTER PREDICTION OF STATIONARY STATES OF MEMBRANES FROM DIF-FERENTIAL PERMEABILITIES.

Aberdeen Univ. (Scotland). Dept. of Chemistry. For primary bibliographic entry see Field 3A. W77-08234

RECENT FLASH FLOODS OF THE DISON BROOK (CRUES BRUTALES RECENTES DU 'RUISSEAU' DE DISON (BELGIQUE): OBSERVATIONS ET PREVISIONS),

Liege Univ. (Belgium), Faculte des Sciences Ap-

For primary bibliographic entry see Field 4A. W77-08250

REGIONAL SIMULATION OF STREAMFLOW

DATA, North Carolina Univ., Raleigh. Dept. of Biological and Agricultural Engineering. For primary bibliographic entry see Field 2A. W77-08298

RECSAD: A COMPUTER PROGRAM FOR RECREA, ION PLANNING. Oklahoma State Univ., Stillwater. Dept. of Geog-

raphy. For primary bibliographic entry see Field 6B. W77-08300

WATER-LEVEL DECLINE AND PUMPAGE IN DEEP WELLS IN THE CHICAGO REGION,

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 2F. W77-08302

A COMPUTERIZED INFORMATION SYSTEM RESOURCES, ARIZONA'S WATER

Arizona Univ., Tucson. Office of Arid Lands Stu-

In: 1973 Proceedings Institute of Environmental Sciences, p. 341-344. 2 fig, 1 tab, 20 ref. OWRT A-031-ARIZ(4), 14-31-0001-5003.

Descriptors: Data storage and retrieval, Hydrologic data, Data processing, *Arizona, Information exchange, Administrative agencies, State government, Local governments, *Information retrieval.

Identifiers: *Information systems.

Water in Arizona is a vital natural resource, that in Water in Arizona is a vital natural resource, that in some portions of the State, is diminishing from groundwater storage at a rapid rate as increased pumping for agricultural, municipal and mining purposes accelerate. Currently in Arizona there exists six State agencies, seven federal agencies, and countless local irrigation districts and city water departments which have specific statutory responsibilities or administrative needs for inventorying, conserving, developing, managing, operating, protecting, and/or monitoring the water resources and related facilities of the State. These divergent information sources plus many university sources suggest the strong need for a system that can make information from a variety of sources accessible to the many different user groups in Arizona a central objective.

ESTIMATING VEGETATIVE BIOMASS FROM LANDSAT-1 IMAGERY FOR RANGE MANAGE-

Nebraska Univ., Lincoln. Conservation Survey Div.

For primary bibliographic entry see Field 4A. W77-08409

DISCRIMINATING COASTAL RANGELAND PRODUCTION AND IMPROVEMENTS WITH COMPUTER AIDED TECHNIQUES,

Lockheed Electronics Co., Inc., Houston, Tex. Aerospace Systems Div. For primary bibliographic entry see Field 4A. W77-08410

USEFULNESS OF LANDSAT DATA FOR MONITORING PLANT DEVELOPMENT AND RANGE CONDITIONS IN CALIFORNIA'S ANNUAL GRASSLAND,

Geological Survey, Sioux Falls, S. Dak. EROS Data Center.

For primary bibliographic entry see Field 4A. W77-08411

MONITORING VEGETATION CONDITIONS FROM LANDSAT FOR USE IN RANGE MANAGEMENT,

Texas A and M Univ., College Station. For primary bibliographic entry see Field 4A. W77-08412

UTILIZATION OF LANDSAT IMAGERY FOR MAPPING VEGETATION ON THE MILLIONTH

SCALE, Kansas Univ., Lawrence, Space Technology

Labs.
D. L. Williams, and J. C. Coiner.
In: Proceedings of the NASA Earth Resources
Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 53-65, September 1975. 4 fig, 14 ref. NASA NGL 17-004-

Descriptors: *Mapping, *Vegetation, *Remote sensing, *Natural resources, Land use, Areal, Satellites(Artificial). Distribution patterns, Forests, Classification, Surveys.
Identifiers: *LANDSAT, *Unesco, Physiog-

The United Nations Education, Scientific and Cultural Organization (UNESCO) has recently published a vegetation classification system. This system, based on the physiognomy of the vegeta-tion, is designed to provide a comprehensive framework for the preparation of vegetation maps of any part of the world at scales of 1:1,000,000 or less. The utility of the system lies in the fact that optimal agricultural land uses are always related to

the natural vegetation. The system is designed for use with maps covering large areas. The large map area, however, poses a severe problem in uniform data collection, especially if large-scale imagery is employed as a mapping base. Since LANDSAT images have a basic utilization scale of 1:1,000,000, identical to that of the projected maps, they would serve as a uniform base for all maps, they would serve as a uniform base for all parts of the world if they contained the informa-tion necessary to delimit vegetation formations. To determine if the information content of the To determine if the information content of the imagery is sufficient to permit mapping according to the Unesco classification, a series of test sites was examined. These sites included examples from the humid tropics, arid and semi-arid subtropics, and temperate zones. In every case, the leasibility of this application of LANDSAT imagery was verified. The imagery may, therefore, be used as a mapping base for the preparation of vegetation maps on the millionth scale. (See also W77-08408) (Humphreys-ISWS)

LANDSAT-1 DATA, ITS USE IN A SOIL SUR-

VEY PROGRAM,
South Dakota State Univ., Brookings. Dept. of
Plant Science; and South Dakota State Univ., Brookings. Remote Sensing Inst. For primary bibliographic entry see Field 2G. W77-08414

ARE CLEAR-CUT AREAS ESTIMATED FROM LANDSAT IMAGERY RELIABLE, Pacific Forest Research Centre, Victoria (British

For primary bibliographic entry see Field 4A. W77-08416

OPERATIONAL CONSIDERATIONS FOR THE APPLICATION OF REMOTELY SENSED FOREST DATA FROM LANDSAT OR OTHER AIRBORNE PLATFORMS,

Saint Regis Paper Co., Jacksonville, Fla. Southern Timberlands Div.

G. R. Barker, and T. P. Fethe.

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In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 115-133, September 1975, 6 fig, 2 tab, 10 ref.

Descriptors: *Forest management, *Pulp and paper industry, *Remote sensing, *Lumbering, *Southeast U.S., Mapping, Forests, Trees, Pine trees, On-site investigations, Analytical techniques, Data processing, Sampling, Surveys, Photogrammetry, Land use, Satellites(Artificial), Aerial photography.

Identifiers: LANDSAT.

The forest data base requirements necessary to manage efficiently a large, timber based forest in-dustry of the 1970's have transcended by a considerable margin those data required two decades ago. These data demands have grown, both in quantitative terms and in the level of precision acceptable to successfully undertake the multiple decision making processes required. From the traditional generation of area/volume and frequency tables used in immediate planning for harvest and cultural activity, data are now subjected to the rigors of long-range planning manipulations, as these data represent the major input to such planning models. To be effective in such planning activity, the data must be provided in a timely manner. Concurrent with the increase in data demand and the speed of preparation, has been the ever increasing difficulty in securing and reducing these data within the timetables demanded. Remote sensing techniques at all levels seemed to offer the most promising prospect in satisfying the data requirements and in alleviating the difficult task of collecting the data. After a thorough review of the technology of remote sensing and the state of the art of interpretation, it was realized that the best hope for a practical, implementable scheme was to approach the problem in three phases, all interrelated, but independent enough to allow for the progressive modular development of a multilevel sampling system. At each stage, operational feasibility will be evaluated so that necessary revisions can be integrated into the system as needed. (See also W77-08408) (Humphreys-ISWS) W77-08417

TYPE SEPARABILITY OUTHEASTERN UNITED STATES ON LAND-

SAT-1 MSS DATA, Lockheed Electronics Co., Inc. Houston, Tex. For primary bibliographic entry see Field 4A. W77-08418

MAPPING OF THE WILDLAND FUEL CHARACTERISTICS OF THE SANTA MONICA MOUNTAINS OF SOUTHERN CALIFORNIA, ESL, Inc., Sunnyvale, Calif. Earth Resources Technology Applications. J. D. Nichols.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 159-166, September 1975, 3 tab.

Descriptors: *Forest management, *California, *Remote sensing, *Forest fires, *Mapping, Analytical techniques, Analysis, Satel-Analytical techniques, Analysis, Satel-lites(Artificial), Data processing, Trees, Grasses, Brush, Fuels, Vegetation, Classification. Identifiers: LANDSAT, *Wildland fuels.

LANDSAT digital MSS data were successfully used to map and evaluate the wildland fuels of the Santa Monica Mountains in Southern California. A mixed classification scheme was used where training areas of known vegetation types were entered, and the maximum likelihood classifier run, followed by an evaluation of the results and an unsupervised retraining of the classifier using an image of the probability of misclassification. Estimation of maturity class and crown closure percents of the major cover types were assigned to each computer class by associating the photo interpretation of 159 large-scale photo samples, with the resultant computer classes using analysis of variance and analysis of categorized data. The result of the computer classification and statistical analysis was then transformed from the LANDSAT Coordinate California State Plane Coordinate system for use in a digital format in the FIRESCOPE data retrieval and fire modeling system. (See also W77-08408) (Humphreys-ISWS) W77-08419

COMPUTER ANALYSIS AND MAPPING OF GYPSY MOTH DEFOLIATION LEVELS IN PENNSYLVANIA USING LANDSAT-1 DIGITAL

National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center. D. L. Williams.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 167-181, September 1975. 3 fig, 1 tab, 22 ref.

Descriptors: *Forest management, *Pennsylvania, *Mapping, *Remote sensing, Insects, Data processing, Surveys, Forests, Entomology, Spa-tial distribution, Satellites(Artificial), Foliar,

Identifiers: *Defoliation, LANDSAT, *Gypsy moths defoliation.

The purpose of this study was to investigate the effectiveness of using LANDSAT-1 multispectral

digital data and imagery, supplemented by ground truth and aerial photography, as a new method of surveying gypsy moth (Porthetria dispar (L.) (Lepidoptera; Lymantriidae) defoliation, which has greatly increased in Pennsylvania in recent years. Since the acreage and severity of gypsy moth defoliation reaches a peak from mid-June through the first few days of July, the July 8, 1973, LANDSAT-1 scene was chosen for analysis. Results indicated that LANDSAT-1 data can be used to discriminate between defoliated and healthy vegetation in Pennsylvania, and that digital processing methods can be used to map the extent and degree of defoliation. (See also W77-08408) (Humphreys-ISWS) W77-08420

COMPUTER IMPLEMENTED CLASSIFICA-TION OF VEGETATION USING AIRCRAFT ACQUIRED MULTISPECTRAL SCANNER

DATA, National Aeronautics and Space Administration, Bay Saint Louis, Miss. Earth Resources Lab. For primary bibliographic entry see Field 4A. W77-08421

THE USE OF SKYLAB DATA TO STUDY THE EARLY DETECTION OF INSECT INFESTA-TIONS AND DENSITY AND DISTRIBUTION OF

HOST PLANTS, Agricultural Research Service, Weslaco, Tex. Southern Region Citrus Insects Research. W. G. Hart, S. J. Ingle, and M. R. Davis.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 203-219, September 1975. 8 fig, 5 ref.

Descriptors: *Vegetation, *Plant groupings, *Texas, *Remote sensing, Insects, Infection, Classification, Spatial distribution, Citrus fruits, Satellites(Artificial), Aerial photography, Instrumentation, Agriculture, Mapping, Photography. Identifiers: *Insect infestations, *Host plants,

A study of the detection of insect infestations and the density and distribution of host plants was undertaken, using Skylab data, aerial photography, and ground truth, simultaneously. Additional ground truth and aerial photography was acquired between Skylab passes. For the evaluation of S-190B data, two 100 square-mile areas within the task site were selected. Area 1, of high density citrus, was located northwest of Mission, Texas. Area 2, located 20 miles north of Weslaco, Texas, contained different varieties of citrus, winter vegetables, sugarcane, irrigated pastures, and brush-covered land. Skylab S-190A data was also evaluated for similar information over the entire Rio Grande Valley and adjacent areas of Mexico. Satellite data such as that obtained from Skylab S-190B offers promise for detection of some insect pests and the distribution of host plants of various insect pests. With comparative observations of film types and seasonal influences on reflectance characteristics, many crop varieties can be identified with Skylab S-190B data. Vegetative patterns in border areas can be detected with Skylab S-190A and S-190B data. This information can be useful in detection avenues of entry of pest species and areas of stress that require greater vigilance in stopping the spread of destructive species. The influence of some environmental factors on crops thay may be confused with pest injury or related factors can be detected and identified with Skylab S-190B data. (See also W77-08408) (Humphreys-ISWS) W77-08422

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

AGRICULTURAL INVENTORY CAPABILITIES OF MACHINE PROCESSED LANDSAT DIGITAL DATA, General Electric Co., Beltsville, Md. Space

Systems Organization. For primary bibliographic entry see Field 3F.

WILDLIFE MANAGEMENT BY HABITAT UNITS-A PRELIMINARY PLAN OF ACTION. For primary bibliographic entry see Field 4A. W77-08426

QUANTITATIVE WATER QUALITY WITH LANDSAT AND SKYLAB. Kansas Univ., Lawrence.

For primary bibliographic entry see Field 5A.

LANDSAT-1 DATA AS IT HAS BEEN APPLIED FOR LAND USE AND WATER QUALITY DATA BY THE VIRGINIA STATE WATER CONTROL BOARD.

Virginia State Water Control Board, Richmond. Div. of Surveillance and Field Studies For primary bibliographic entry see Field 5A. W77-08432

A COMPARATIVE INTERREGIONAL ANALY-SIS OF SELECTED DATA FROM LANDSAT-1 AND EREP FOR THE INVENTORY AND MONI-TORING OF NATURAL ECOSYSTEMS,

Earth Satellite Corp., Berkeley, Calif C. E. Poulton.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 507-568, September 1975. 10 fig, 22 tab, 4 ref, 3 append.

Descriptors: *Ecosystems, *Monitoring, *Remote sensing, *Colorado, *California, *Nevada, Mapping, Satellites(Artificial), Water resources, Natural resources, Vegetation, Land use, Costs, Soils, Evaluation, Sampling, Topography, Management, Census, Spatial distribution, Data processing, Aerial photography. Identifiers: LANDSAT, Skylab.

The paper presented comparative statistics on the capability of LANDSAT-1 and three of the Skylab remote sensing systems (S-190A, S-190B, and S-192) for the recognition and inventory of analogous natural vegetations and landscape features that are important in resource allocation and management. Investigations were conducted in two analogous regions presenting vegetational zonation from salt desert to alpine conditions above timberline. The visual interpretation mode was emphasized. An hierarchical legend system was used as the basic classification of all land surface features. Given adequate ground truth and a knowledge of what to expect ecologically within each region, it was possible to map and identify many features to the fourth hierarchical (frist floristic) level in the classification system. Fourth level decisions were, however, strongly based on recognizing associated features and convergence of evidence. Identifications at second and third levels (physiognomic and structural criteria) were generally photo-identifiability with the difference sensor systems, and mapping and interpretation tests were made, both in monocular and stero interpretation, with all systems except the S-192. Significant advantage was found in the use of stereo from space when image analysis is by visual or visual-machine-aided interactive systems. Some cost factors in mapping from space were identified. The various image types were compared, and an operational system was postulated. (See also W77-08408) (Humphreys-ISWS) W77-08436

REMOTE SENSING APPLICATIONS IN KAN-SAS, Kansas Univ., Lawrence. Space Technology

Labs. For primary bibliographic entry see Field 4A. W77-08437

A CONTROLLABLE AUTOMATED ENVIRON-MENTAL DATA ACQUISITION AND MONI-TORING SYSTEM, Brookhaven National Lab., Upton, N. Y.

D. G. Dimmler, N. Greenlaw, and S. Rankowitz. Preprint BNL 20665, November 1975. 22 p, 16 fig,

Descriptors: *Monitoring. *Instrumentation. *Estuaries, Equipment, Sampling, Data collections, Environment, Coasts, Tidal waters, Temperature, Water temperature, Conductivity, Currents(Water), Velocity, Telemetry, Automation, Oceanography.

Identifiers: *Data acquisition systems, Remote sampling systems.

A real time data acquisition and monitoring system was developed for coastal oceanographic parameter measurements. This system continuously measures profiles of temperature, conductivity, current velocity, and direction as a function of depth at a number of fixed offshore locations. The data acquisition, monitoring, and control system features make this system generally suitable for unattended area monitoring applications. (Sims -

W77-08441

GUIDE TO THE USE OF HISARS -HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM, Idaho Univ., Moscow. Dept. of Agricultural En-

gineering. M. Molnau.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 226, Price codes: A05 in paper copy, A01 in microfiche. Agricultural Experiment Station, Miscellaneous Series, No. 32, December 1975. 82 p, 19 ref. OWRT A-045-IDA(1).

Descriptors: *Hydrologic data, *Data collections, *Data storage and retrieval, Publications, *Information retrieval, *Computer programs. Identifiers: *HISARS manual

The HISARS (Hydrologic Information Storage and Retrieval System) was developed out of a need to have a large body of hydrologic data available for ease of access. In this system the data are stored on a magnetic disk pack and the data retrieved by the Indexed Sequential Access Method (ISAM). This manual is organized into three sections; the ACCESS facilities, the PROCESS facilities, the COPY facilities. The AC-CESS facilities allow a user to obtain listings of data in a standard format. These are described in detail. The PROCESS facilities allow routine types of analyses on the data. These are described in detail. The PROCESS facilities allow routine types of analyses on the data. These are relatively standard types of programs. The COPY facility allows the user to copy data from the disk pack and store it on a private tape or data set where it will be used as input to a user written program. W77-08445

COMPUTER PROGRAM FOR RESERVOIR-WATER BUDGETS,

Agricultural Research Service, Chickasha Okla. Southern Great Plains Watershed Research

For primary bibliographic entry see Field 4A.

THE EUTAW-MCSHAN AQUIFER IN MISSIS-

SIPPI, Geological Survey, Jackson, Miss. Water Resources Div. E. H. Boswell.

Water-Resources Investigations 76-134 (open-file report), March 1977. 2 sheets, 17 fig, 3 tab, 20 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water quality, *Mississippi, Water supply, Water wells, Water yield, Water level fluctuations, Chemical analysis, *Maps.

Identifiers: *Eutaw Formation(Miss), *McShan Formation(Miss), Cretaceous aquifers.

This report, the fifth in a series of 'atlas-type' reports, summarizes the large amount of unpublished data available for the Eutlaw-McShan aquifer in Mississippi. The Eutlaw-McShan aquifer, of Cretaceous age, consists of the inter-connected irregular sand beds in the Eutaw and McShan Formations. The aquifer contains fresh water in an area of about 8,000 sq mi in northeastern Mississippi. Water produced from the aquifer by 59 water systems and several industries in 1975 averaged about 24 mgd. Water levels have declined about 200 feet below levels of the early 1900's at Tupelo and West Point and it is estimated that the aquifer is developed to near its potential yield at those places. The aquifer is used extensively in areas where the dissolved-solids concentration of the water is more than 500 mg/liter and in some places where the concentration exceeds 1,000 mg/liter. The most common water-quality problems are excessive chloride and fluoride. (Woodard-USGS) W77-08466

DISSOLVED SOLIDS, HARDNESS, AND ORTHOPHOSPHATE OF SURFACE-WATER RUNOFF IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT,

Geological Survey, Tallahassee, Fla. Water Resources Div.

J. E. Earle.

*Orthophosphates.

Water-Resources Investigations 76-16 (open-file report), 1976, 6 p. 3 maps, 4 ref.

Descriptors: *Surface runoff, *Hardness(Water), Descriptors: Surface funds, American Phosphates, *Dissolved solids, *Florida, Regional analysis, River basins, Water quality, *Maps, Chemical analysis. Florida. Identifiers: *Northwest

Historical water-quality data collected from January 1965 to September 1970 were used to prepare maps showing the generalized distribution of dissolved solids, hardness, and orthophosphate in streams and lakes in the Northwest Florida Water Management District. The regional concentration patterns shown on the maps are generalized and local variations may be expected. The dissolved-solids concentrations generally range from 10 to 150 milligrams per liter. Higher concentrations are found in the coastal area on tide affected streams. The concentrations of hardness as CaCO3 generally range from 5 to 140 milligrams per liter. The concentrations of dissolved orthophosphate generally range from 0 to 0.75 milligrams per liter. These maps provide information to those concerned with water resources management and establish a basis for comparing future water-quality data. (Woodard-USGS) W77-08467

WATER-RESOURCES INVESTIGATIONS IN SOUTH DAKOTA, 1976.
Geological Survey, Huron, S.D. Water Resources

Water-Resources Investigations in South Dakota Folder, 1976. 1 sheet.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *South Dakota,

Data collections, Programs, Sites, *Maps, Publications.

This folder contains a brief description of the water-resources investigations in South Dakota in which the U.S. Geological Survey participates and a list of selected references. The principal map shows the location of hydrologic-data stations and the extent of the hydrologic investigations. Small maps give a broad picture of variations in some of the hydrologic characteristics pertaining to South Dakota's water resources. Surface-water data-collection sites include 212 streamflow stations, 9 lake and reservoir stations, and 36 water-quality stations. Ground-water sites include 424 observation wells. Water-quality data are collected at 29 of these wells. (Woodard-USGS) W77-08468

FLOODS OF NOVEMBER 12, 1974, IN THE CHARLOTTE AMALIE AREA, ST. THOMAS, U.S. VIRGIN ISLANDS,

Geological Survey, Miami, Fla. Water Resources Div.; and Geological Survey, San Juan (Puerto Rico). Water Resources Div.

W. J. Haire, and K. G. Johnson. Water-Resources Investigations 91-76 (open-file report), 1977. 3 sheets, 6 fig, 3 plates, 1 tab, 3 ref.

Descriptors: *Floods, *Flood profiles, *Virgin Islands, *Flood recurrence interval, Flood stages, Hydrologic data, Evaluation, Land use, Planning, *Maps.

Identifiers: *St Thomas Island, 60-year flood, Inundated areas.

The flood on St. Thomas, U.S. Virgin Islands, of November 12, 1974, was the largest recorded flood in the area from Fort Christian through Charlotte Amalie and Frenchtown to the end of Crown Bay. This flood has a recurrence interval of about 60 years. With the exception of a few narrow beaches, very little flooding occurred outside of the Charlotte Amalie area. The flood boundaries are controlled to a large extent by the prevailing channel and flood-plain conditions. Inundation from future floods may be affected by changes in channel conditions, alteration of waterway openings at roads, changes in runoff characteristics of the stream caused by increased urbanization, and other cultural developments. The areas inundated by the 1974 flood are shown on 2 maps. (Woodard-USGS) W77-08470

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MAPS SHOWING GROUND-WATER CONDITIONS IN THE PUERCO-ZUNI AREA, APACHE AND NAVAJO COUNTIES, ARIZONA—1975, Geological Survey, Flagstaff, Ariz. Water Resources Div.

Water-Resources Investigations 77-5 (open-file report), January 1977, 3 sheets, 8 ref.

Descriptors: *Groundwater resources, *Water wells, *Water levels, *Water quality, *Arizona, Water table, Mapping, Contours, Profiles, *Maps. Identifiers: *Apache and Navajo Counties(Ariz), *Puerco-Zuni area(Ariz).

This 3-sheet atlas describes ground-water conditions in the Puerco-Zuni area of northeastern Arizona which includes about 2,800 sq mi. The main source of water is ground water in the several aquifers that are made up of one or more formations. Maps show ground-water conditions in the Coconino aquifer; in the Moenkopi and Chinle Formations; and in the Bidahochi aquifer and the alluvium. Information on the maps includes depth to water, altitude of the water level, and chemical quality of the water; scale 1:125,000. (Woodard-USGS)

TIME OF TRAVEL OF SOLUTES IN THE EAST FORK TRINITY RIVER, NOVEMBER 1975: AND ELM FORK TRINITY RIVER, DECEMBER 1975; TRINITY RIVER BASIN, TEXAS,

Geological Survey, Fort Worth, Tex. Water Resources Div.

D. R. Myers, and R. M. Slade, Jr.
Open-file report 76-683, November 1976. 3 sheets, 2 fig. 2 tab. 4 ref.

Descriptors: *Travel time, *Solutes, *Rivers, *Tracking techniques, *Fluorescent dye, *Texas, Forecasting, Path of pollutants, Data collections, Sampling, Sites, Hydrographs, *Maps. Identifiers: *East Fork Trinity River(Tex), *Elm Fork Trinity River(Tex).

In Texas, the time of travel of solutes in the East Fork Trinity River and the Elm Fork Trinity River was determined in 1975 by injecting a fluorescent dye (Rhodamine WT, 20-percent solution) that could be detected by fluorometric analysis of water samples collected at selected downstream sites. Plots of dye concentration versus time were made for each injection and sampling site. The graphs were then used to determine arrival times of the leading edge, the peak, and the trailing edge of the dye cloud. The study in November 1975 was conducted on the East Fork Trinity River from just below the Rockwall-Forney Dam at Lake Ray Hubbard to the confluence with the Trinity River, a distance of 27.0 miles. The study in December 1975 was conducted on the Elm Fork Trinity River from just below the dam at Lewisville Lake to the Spur 482 crossing, a distance of 25.7 miles. (Woodard-USGS)

HYDROLOGIC UNIT MAP--1974, STATE OF TEXAS.

Geological Survey, Reston, Va. Water Resources

Available from Branch of Distribution, USGS, Box 25286, Federal Ctr. Denver, CO 80225, price \$3.50. Hydrologic Unit Map of Texas, 1976. 4 sheets.

Descriptors: *Maps, *Hydrology, *Texas, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.

Identifiers: *Hydrologic unit maps(Tex),
*Hydrologic boundaries, Subregions, Accounting
units, Cataloging units.

This map and accompanying table show Hydrologic Units in Texas that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)

HYDROLOGIC UNIT MAP--1974, STATE OF OKLAHOMA.

Geological Survey, Reston, Va. Water Resources Div.

Available from U.S. Geological Survey, Denver, Colo. 80225, price \$1.25. Hydrologic Unit Map of Oklahoma, 1976, 1 sheet.

Descriptors: "Maps, "Hydrology, "Oklahoma, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources. Identifiers: "Hydrologic unit maps(Okla), "Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Oklahoma that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS) W77-08475

HYDROLOGIC UNIT MAP--1974, STATE OF SOUTH DAKOTA.

Geological Survey, Reston, Va. Water Resources Div.

Available from Branch of Distribution, USGS, Box 25286, Denver, CO 80225, price \$1.25. Hydrologic Unit Map of South Dakota, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *South Dakota, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources. Identifiers: *Hydrologic unit maps(S Dak), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in South Dakota that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units speviously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS) W77-08476

HYDROLOGIC UNIT MAP--1974, STATE OF KANSAS.

Geological Survey, Reston, Va. Water Resources Div.

Available from Branch of Distribution, USGS, Box 25286, Denver Colo. 80225, price \$1.25. Hydrologic Unit Map of Kansas, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *Kansas, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.

systems, Regions, Land resources.
Identifiers: "Hydrologic unit maps(Kans),
'Hydrologic boundaries, Subregions, Accounting
units, Cataloging units.

This map and accompanying table show Hydrologic Units in Kansas that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS) W77-08477

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

DIGITAL-COMPUTER MODEL OF THE SAND-STONE AQUIFER IN WISCONSIN, SOUTHEASTERN Survey, Madison, Wis. Water Geological Resources Div. For primary bibliographic entry see Field 2F.

ACTIVITIES OF THE WATER RESOURCES DIVISION IN CALIFORNIA.
Geological Survey, Menlo Park, Calif. Water Resources Div.

California District report, 1977. 20 p, 1 map.

Descriptors: *California, *Water resources, *Programs, *Data collections, Surface waters, Groundwater, Water yield, Water quality, Sediment transport, Projects, Publications.

Identifiers: *US Geological Survey(Calif), 1977 projects, 1976 reports, Cooperating agencies

This report summarizes the scheduled 1977 activities of the Water Resources Division, U.S. Geological Survey, in California. Reports issued by the Geological Survey on studies completed in 1976 are also listed. Most of these activities are conducted in cooperation with other Federal, State, county, or local public agencies. These cooperating agencies are listed. The investigations of the water resources of California by the Division fall into three broad categories: (1) Hydrologic-data network, (2) resource appraisal studies, and (3) research. The collection of basic data through the hydrologic-data network is concerned with the location, quantity, quality, movement, and occurrence of the water resource. The records appear in annual or regular publications of basic data. Appraisal studies of water-resources conditions on an areal basis or directed to a specific water problem are a significant phase of the program. Research studies are underway to determine fundamental principles and to improve methodology as applied to hydraulics, hydrology, and related fields of science. (Woodard-USGS) W77-08479

WATER RESOURCES DATA FOR CONNEC-TICUT, WATER YEAR 1975,

Survey, Hartford, Conn. Water Geological Resources Div.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 435, Price codes: A17 in paper copy, A01 in microfiche. Water-Data Report CT-75-1, April 1976. 366 p, 3 fig, 4 tab, 34 ref.

Descriptors: *Connecticut, *Hydrologic data, Descriptors: "Connecticut, "Hydrologic data, *Surface waters, "Groundwater, "Water quality, Gaging stations, Streamflow, Flow rates, Sedi-ment transport, Water analysis, Chemical analy-sis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites, Estuaries, Tidal waters. Identifiers: Annual State report(Conn).

Water resources data for the 1975 water year for Connecticut consist of records of stage, discharge, and water quality of streams; contents and water quality of lakes and reservoirs; and water levels and water quality in wells. This report contains discharge records for 56 gaging stations; tidal volume for 1 gaging station; stage only records for 3 tidal-gaging stations; contents for 36 lakes and reservoirs; water quality for 16 gaging stations, 39 partial-record flow stations, 3 lakes, 12 tidal stations, and 4 wells; and water levels for 27 observation wells. Also included are 65 crest-stage partialrecord stations and 55 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Connecticut. (Woodard-USGS)

SMALL-STREAM FLOOD INVESTIGATIONS IN MINNESOTA, OCTOBER 1958 TO SEP-TEMBER 1975. Survey, St. Paul, Minn. Water Geological

Resources Div. For primary bibliographic entry see Field 2E. W77-08481

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1974-75 WATER

Geological Survey, Austin, Tex. Water Resources

For primary bibliographic entry see Field 5A. W77-08483

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1975.

Geological Survey, Albany, N.Y. Water Resources Div. Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 669, Price codes: A10 in paper copy, A01 in microfiche. Water-Data Report NY-75-1, June 1976. 735 p, 8 fig, 4 tab, 29 ref.

Descriptors: *New York, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analy-

sis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites, Tidal streams. Identifiers: Annual State report(NY).

Water resources data for the 1975 water year for New York State include records of surface water, water quality, and ground water. The surfacewater section contains discharge data for 209 gag-ing stations, stage-content data for 39 lake and reservoir stations, and stage-only data for 31 stations (6 of which are tidal stations). Also included are discharge data for 174 partial-record stations (86 crest-stage and 88 low-flow stations) and 199 miscellaneous sites. The water-quality section contains chemical, temperature, and suspendedsediment data on surface water for 151 stations, 81 partial-record stations, and 113 miscellaneous sites, as well as chemical data for 233 groundwater miscellaneous sites and 10 precipitationquality stations. Water-level data are included for 42 long-term observation wells. (Woodard-USGS) W77-08485

WATER QUALITY IMPACTS OF URBANIZA-TION-A METHODOLOGY, Economic and Social Commission for Asia and the

Pacific (UN), Bangkok (Thailand). Div. of Industry, Housing, and Technology.

For primary bibliographic entry see Field 5B.

8. ENGINEERING WORKS

8A. Structures

CONSTRUCTION AND MAINTENANCE COSTS OF SEWER SYSTEMS (BAU- UND BETRIEB-SKOSTEN VON KANALISATIONSANLAGEN), H. Haendel.

Berichte der Abwassertechnischen Vereinigung, e.V., No 29, p 205-219, 1976. 9 tab.

Descriptors: *Sewers, *Construction costs, *Maintenance costs, *Operating costs, Topography, Soil types, Population, Density, Groundwater, Construction materials, Climates, Piping, Earthworks, Cost analysis.

Construction, operating, and maintenance costs of sewer systems are discussed. The construction costs are influenced by such factors as topo-graphic conditions, population density, type of

ground, groundwater level, weather conditions, type and price of the pipes and other installations. Charts are presented for the determination of the cnarts are presented for the determination of the specific costs of earthworks and piping. The high construction costs fully justify the use of high-quality, more or less expensive pipes to increase the life of the sewer system. (Takacs-FIRL) W77-08542

DESIGN AND OPERATION OF RAIN RETENTION BASINS (ENTWURF UND BETRIEB VON REGENRUCKHALTEBECKEN),

E. Malpricht. Berichte der Abwassertechnischen Vereinigung e. V., No 29, p 147-162, 1976. 12 fig, 6 ref.

Descriptors: *Water storage, *Basins, *Design criteria, *Storm runoff, *Model studies, Sewers, Canals, Construction, Canal construction, Engineering, Flow, Operations.
Identifiers: *Rain retention basins.

Design calculations and operation of rain retention basins are described. The value of the design rainfall frequency can be reduced for canals having a small slope within the sewer system. The feed canal should be as high as possible to prevent set-tling. The longitudinal slope of the retention basin should not be greater than 0.5%; the transversal slope should be 3-5%. The dry-weather runoff can pass through the retention basin. The calculation of rainwater retention basins according to Specification A 117 is described. (Takacs-FIRL) W77-08547

8B. Hydraulics

DRIFT VELOCITIES OF SURFACE FILMS OVER WAVES,
Connecticut Univ., Storrs. Inst. of Water

Resources. For primary bibliographic entry see Field 5B.

W77-08193

THE EFFECT OF AERATION OF WATER JET SPREADING, Connecticut Univ., Storrs, Inst. of Water

A. H. Hsia

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 717, Price codes: A12 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1977. 236 p, 4 tab, 77 fig, 56 ref, 3 append. OWRT A-050-CONN(5). 14-31-0001-3507.

Descriptors: *Jets, *Aeration, *Hydrodynamics, *Flow characteristics, *Turbulent flow, Discharge(Water), Cooling water, Thermal pollution.

Identifiers: *Aerated turbulent jet flow, *Water jet behavior, *Axisymmetric jets, *Planar aerated jets, *Jet trajectory.

Theoretical and experimental studies were made on jet characteristics when a large number of small air bubbles (.050 to .080 in. dia) were injected into the submerged water jet to form a two phase flow. In the experimental studies for both axisymmetric and planar aerated jets, initial jet velocity was varied from 1.39 to 9.23 ft/sec, initial air to mixture void fraction from 0 to .495, initial temperature difference between the jet and its ambient from 0 to 34.2 C, and for the aerated planar jet tests, submergence from 4.9 to 14.9 in. Respective influences from these parameters on jet behavior were investigated. The dependent variables measured included jet trajectory, local jet diameter or thickness for a planar jet, and centerline temperature decay. The theoretical analyses for both ax-isymmetric and planar aerated jets were based on a separated-flow model in which fundamental equations characterizing each phase of the air-water mixture were included. The system of differential equations was solved numerically and yielded predictions in agreement with the experimental data. Aeration was an effective means for bringing the jet to the free water surface, and the extent of aeration influence on jet path was a function of both initial velocity and void fraction. The discharge submergence was influential in determining planar jet dividing streamline path. Faster centerline temperature decay due to aeration was only detected in vertical axisymmetric jets. (de Lara-Conn)

EFFECTS OF MEANDERING IN ALLUVIAL STREAMS.

Battelle-Pacific Northwest Labs. Richland, Wash. For primary bibliographic entry see Field 2E. W77-08216

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; THE WIND-DRIVEN CURRENTS AND CONTAMI-NANT DISPERSION IN THE NEAR-SHORE OF

Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.

For primary bibliographic entry see Field 5B. W77-08220

EFFECTS OF 40-FOOT CHARLESTON HAR-BOR PROJECT ON TIDES, CURRENTS, AND SALINITIES: HYDRAULIC MODEL INVESTIGATION, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.

For primary bibliographic entry see Field 2L. W77-08222

ALTERNATIVE MEASURES OF RIVER CHAN-NEL SHAPE AND THEIR SIGNIFICANCE, Papua and New Guinea Univ., Port Moresby (New

Guinea). Dept. of Geography. G. Pickup.

Journal of Hydrology (New Zealand), Vol. 15, No. 1, p 9-16, 1976. 3 fig, 11 ref.

Descriptors: *Rivers, *Shape, *Open channels, Descriptors: "Avers, Sanpe, "Open channels, Channels, Hydraulics, Dimensions, Size, Width, Water levels, Depth, River beds, Foreign research, Foreign countries. Identifiers: *New Guinea, Hydraulic geometry.

The width/depth ratio is not always the best meaonly at the bankfull stage. Therefore, the width/depth ratio is insensitive to some types of shape difference and as a result may not reflect the effect of variations in sediment characteristics. Two alternative measures were proposed: bed width, and the exponent x in the equation Wi c(D to the x power), where Wi is width at stage D. In Cumberland Basin stream channels, bed width increases with mean size of the bed material, while x decreases, reflecting shape adjustment to in-creasing bed-load transportation. (Humphreys-ISWS) W77-08241

EFFECT OF LATERAL INFLOW ON STEADY OPEN CHANNEL FLOWS, Connecticut Univ., Storrs.

For primary bibliographic entry see Field 2E. W77-08290

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100 MESH SAND IMPROVES HYDRAULIC FRAC RESULTS. For primary bibliographic entry see Field 4B. W77-08312

DEEP WELLS FOR DEWATERING OFFER REAL ADVANTAGES, PART II, For primary bibliographic entry see Field 4B.

W77-08325

STATISTICAL CHARACTERIZATION OF DILUTE PARTICULATE SUSPENSIONS IN TURBULENT FLUID FIELDS, Illinois Univ. at Urbana-Champaign. Dept. of

Nuclear Engineering.
For primary bibliographic entry see Field 5B. W77_08330

OPTIMAL LAYOUT AND DESIGN OF STORM SEWER SYSTEMS, Illinois Univ. at Urbana-Champaign, Dept. of Civil

Engineering. For primary bibliographic entry see Field 5D. W77-08334

A FINITE ELEMENT MODEL TO DETERMINE THE EFFECT OF LAND-USE CHANGES ON LOOD HYDROGRAPHS,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 246. Price codes: A07 in paper copy, A01 in microfiche. MS Thesis, November 1975. 117 p, 10 tab, 20 fig, 48 ref, 4 append. OWRT A-062-VA(1).

Descriptors: *Land use, Floods, Hydrograph analysis, *Finite element analysis, Computer models, Model studies, Channel flow, Overland flow, *Mathematical models, *Virginia. Watersheds(Basins).

Identifiers: Finite element model, Galerkin's residual method, *South River watershed(Va).

The finite element theory, in conjunction with Galerkin's residual method, was used to mathematically route overland and channel flow. This numrical procedure was applied to the kinematic equations of one-dimensional transient flow in open channels. A one-dimensional finite element scheme was used to simulate overland flow over the watershed and open channel flow in the main stream, after a finite element grid had been devised for both the watershed and the streams. Rainfall excess, the major input parameter, was obtained as a function of rainfall, depending on soil properties and existing land-use conditions across the watershed. The model was tested and calibrated on a natural watershed. The nature of the finite element procedure allowed changes in land-use to be easily incorporated into the model. The effect of several arbitrary land-use changes upon the response of the river under flood conditions was observed. The effect of changes in the number and size of the elements in the watershed and the streams was also observed along with changes in the size of the time increment. W77-08450

SMALL-STREAM FLOOD INVESTIGATIONS IN MINNESOTA, OCTOBER 1958 TO SEP-TEMBER 1975, Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 2E.

W77_08481

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1976. Geological Survey, Helena, Mont. Water

Resources Div. or primary bibliographic entry see Field 2E. W77_08482

8C. Hydraulic Machinery

PUMPED STORAGE POTENTIAL OF THE HELLS CANYON AREA, Idaho Univ., Moscow. Dept. of Civil Engineering.

L. D. Coupe

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 722, Price codes: A07 in paper copy, A01 in microfiche. Master of Science Thesis, April 1977. 132 p, 35 fig, 7 tab, 28 ref, append. OWRT B-037-IDA(1). 14-31-

Descriptors: *Pumped storage, Electric power, *Hydroelectric plants, *Reservoir operations, Water level fluctuations, Economics, Feasibility, Feasibility studies, Social values, *Environmental effects, Peak discharge, Nuclear powerplants, National recreation areas, Idaho, Oregon, *Sites. Identifiers: *Hells Canyon, Hells Canyon Dam, Snake River, Barber Flat, Bear Creek.

The potential for pumped storage hydroelectric development of the Hells Canyon area is reviewed, with conclusions drawn from preliminary investigation. Background information covers the concept and application of pumped storage, Hells Canyon's physical characteristics and history and its status as a National Recreation Area. Of eighteen potential storage sites noted, the three most promising are analyzed in detail. For each, preliminary designs have been developed as well as computer analyses of the reservoir water level fluctuations that would result from such operations. Each is also analyzed for economic feasibility. Conclusions are that pumped storage in the area is too expensive to be competititve now, but it may be more feasible in the future. Possible major environmental and social effects are noted; the sites are compared, and one (Barber Flat, Idaho) is recommended for further consideration. Alternative uses of pumped storage in Hells Canyon are (1) to relieve Hells Canyon Dam of objectionable peaking, (2) to cool a nuclear power plant. For the latter, Bear Creek No. 1 is recommended for further study. W77-08196

PUMPED-STORAGE IN THE PACIFIC NORTHWEST, AN INVENTORY. Corps of Engineers, Portland, Oreg. North Pacific

Div. For primary bibliographic entry see Field 2H.

PRODUCTION OF ENERGY FROM CONCENTRATED BRINES BY PRESSURE-RETARDED OSMOSIS, 1. PRELIMINARY TECHNICAL AND ECONOMIC CORRELATIONS,

Ben Gurion Univ. of the Negev, Beersheba (Israel). Research and Development Authority. For primary bibliographic entry see Field 3A. W77-08233

KELLY CARE EXTENDS SERVICE LIFE. Drilco, Houston, Tex.

D. W. Brinegar.
Oil and Gas Journal, Vol. 75, No. 18, p 267-278, May 2, 1977. 5 fig, 4 tab, 5 ref.

Descriptors: *Rotary drilling, *Drilling equipment, *Maintenance, Fatigue(Mechanics), *Maintenance, Failures(Mechanics). Identifiers: *Drill kellys, Drive assemblies.

Kellys, the transmission link between the surface power of the rig and the drill bit, are meeting increasing demands as drilling and drilling technology evolve. The Kelly's ability to perform over a long period depends largely on control of normal wear and keeping clearance between Kelly flats and the drive roller assembly at a minimum. Aside from thread damage, Kellys fail as a result of becoming crooked or bent, from fatigue at certain

Field 8-ENGINEERING WORKS

Group 8C-Hydraulic Machinery

key points, or from excessive rounding of drive corners. Proper attention to handling and to the relationship between normal wear or both Kelly and drive assembly will do much to help prolong kelly life. Reversing ends and remilling are two methods of repairing a worn kelly, provided that the repairs are done before excessive and irreversible damage is sustained. (Eberle-NWWA) W77-08311

THE ERDA GEOTHERMAL PROGRAM, Energy Research and Development Administration, Washington, D.C. For primary bibliographic entry see Field 4B.

BETTER PROTECTION FOR CASING AND TOOL JOINTS,
Reed Tool Co., Houston, Tex.

Reed Tool Co., Houston, Tex. For primary bibliographic entry see Field 8G. W77-08315

IT'S YOUR LOSS, For primary bibliographic entry see Field 8G. W77-08319

AIR, MIST AND FOAM DRILLING, A LOOK AT THE LATEST TECHNIQUES, PART 2, R. A. Hook, L. W. Cooper, and B. R. Payne. World Oil, Vol. 184, No. 6, p 83-90, May, 1977. 3 fig. 4 ref

Descriptors: *Rotary drilling, *Drilling equipment, *Drilling fluids, Foaming, Wells, Oil wells, Burning, Aeration.

Ing., *Actation.'
Identifiers: *Air-rotary drilling, *Mist and foam drilling, *Acrated fluid drilling, Drill collars, Air-percussion hammers, Drill string wear, Stuck pipe, Downhole fires and explosions.

The single most important factor in air and mist drilling is the volume of air used. 2000 to 2400 cubic feet per minute (through 41/2 inch drill pipe in a 77/8 inch hole) is adequate for most air drilling situations. Mist drilling requires 30 to 40% more air, with pressures of 200-400 psig as compared to 100-300 psig for air alone. When a water-bearing formation is encountered, air drilling becomes impossible and a mist of water plus soap must be employed. Should the volume of water entering the bore become too great, even mist may have to be abandoned and aerated drilling mud utilized instead. Hole deviation can become a serious problem in any drilling operation, but can be minimized in air/mist drilling with the use of square drill collars, stabilizers, and reamers. All help prevent bending and binding of the drill string. Air-percussion hammers are also helpful in maintaining a straight hole, because they require relatively little bit weight. Proper care and drilling technique can make air/mist drilling an economical method, but constant, close supervision is essential for preventing such problems as stuck drill strings and expensive fishing operations. (EberleNWWA)

RESEARCH INTO THE IMPACT ON ELECTRI-CAL EQUIPMENT FROM VARIABLE SPEED OPERATION OF PUMPED-STORAGE PLANTS, General Electric Co., Schenectady, N.Y. Electronic Power Conditioning and Control Lab. T. A. Lipo.

Final Report (SRD-77-063), April 8, 1977. 172 p, 99 fig, 24 tab, 3 append. Bur Reclam 6-07-DR-50090.

Descriptors: *Electrical equipment, storage, *Operation, *Performance, *Power system operation, *Electrical design, electric generator, *Power transformers, switches, Electric relays, Switch gear, *Electric converters.

converters.
Identifiers: *Variable speed operation(Pumped - storage plants).

Work was conducted to determine the effect of operating electrical equipment of pumped-storage plants over a variable frequency range of 30 to 81 Hz. The motivating factor behind the study was the desire to improve pumped-storage hydro efficiency. The reversible Francis type pump-turbine represents a compromise design to achieve a best overall efficiency at constant speed for a particular head. The variable speed concept would allow speed to change with head variations while maintaining optimum pump-turbine efficiency over the entire head range. The electrical equipment considered includes the generator/motor, excitation equipment, switchgear and bus, metering, surge protection, relaying, and power transformer. Converter harmonics and the converter effect on system power factor are analyzed for the generator/motor. A simulation study was conducted on a hybrid computer to identify potential system problems which arise from variable speed operation. (Bur Reclam) W77-08492

SEWAGE PUMPING STATION BUILT TO HANDLE FUTURE SYSTEM DEMANDS, Topeka Water Pollution Control Dept. Kans. J. D. Glidewell, Jr.

Water and Sewage Works, Vol 124, No 4, p 105-106, April, 1977.

Descriptors: *Pumping plants, *Pumps, *Design criteria, Planning, Engineering structures, Cities, Sewage treatment, Automatic controls, Maintenance, Performance, Operations, Waste water treatment, Kansas. Identifiers: Topeka(KS).

A pumping station of 'concentric cylinder' design was constructed in Topeka, Kansas. The automated station, with computer monitoring, houses variable speed pump and motor combinations which are designed to meet normal growth demands. The system included a 44 foot deep, 22 foot diameter center wet well for sewage which first passes through bar screens. Two variable speed solids-handling pumps have a 21 mgd capacity, and the third has a 14 mgd rating. A 50 mgd design capacity was built into the system. The pumps have mixed-flow sewage-type closed impellers to aid handling of large solids and stringy materials. (Collins-FIRL)

8D. Soil Mechanics

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR NEW ORLEANS, LOUISIANA (LAKE PONTCHARTRAIN, LOUISIANA, AND VICINI-TY HURRICANE PROTECTION PROJECT), Geological Survey, Baton Rouge, La. Water

Resources Div. H. L. Leone, Jr.

Open-File Report 76-758, October 1976. 22 p, 4 fig, 11 tab, 7 ref.

Descriptors: *Flood protection, *Levees, *Design criteria, *Core drilling, *Water quality control, Water analysis, Sediments, Chemical analysis, Construction, Planning, Hurricanes, Tides, Estuaries, Floods.
Identifiers: *Lake Pontchartrain area(La), Pre-

construction data.

When a hurricane approaches the New Orleans, Louisiana area, the accompanying tides and heavy rainfall increase the level of water in Lake Borgne, Mississippi Sound, and Lake Pontchartrain and pose a major threat of water damage to the populated areas. During Hurricane Betsy (1965), for example, the level of Lake Pontchartrain rose as much as 13 feet. Nineteen core-material-sampling sites were chosen by the U.S. Army Corps of Engineers as possible borrow areas for fill material to be used in levee construction for flood protection

around Lake Pontchartrain. Twenty-three receiving-water sites were also selected to represent the water that will contact the proposed levees. Selected nutrients, metals, pesticides, and other organic constituents were analyzed from bed-material and native-water samples as well as upon elutriate samples of specific core material-receiving water systems. The results of these analyses are presented without interpretation. (Woodard-USGS)
W77-08165

CHANNELIZATION: ENVIRONMENTAL, GEOMORPHIC AND ENGINEERING ASPECTS, North Carolina Univ. at Charlotte. Dept. of Geography and Earth Science. E. A. Keller.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 051, Price codes: A06 in paper copy, A01 in microfiche. Reprint of paper to appear in: Geomorphology and Engineering, 1976 ed. by D. R. Coates. Dowden, Hutchinson & Ross, Inc., 52 p. 21 fig., 24 ref. OWRT B-089-NC (1).

Descriptors: *Channel improvement, *Geomorphology, *Hydrology, *Channel morphology, *Design, *Design criteria, Channel design, Streams, Channel erosion, Fluvial sediment, Urban hydrology, Bank erosion, Alluvial channels, Shape, Slopes, Width. Identifiers: Channelization, Fluvial processes, Rural streams, Urban streams.

The behavior of alluvial streams is not well understood. Therefore, until more information concerning relations between fluvial processes channel form and biologic systems in streams is available for application to channel design it is recommended that channelization should be minimized and the minimum control provided to obtain the desired (or modified) objectives. Several concepts of fluvial geomorphology and fluvial hydrology that are now or eventually may be useful in designing channels are: (1) streams are open systems in which channel form and process evolve in harmony; (2) convergence and divergence of flow is associated with scour and deposition of sediment;
(3) geomorphic thresholds or feedback in open systems may be inherent in the processes of erosion and in change of channel pattern; and (4) relasoon and in change of channel pattern; and (4) rest tions between erosion, deposition and sediment concentration have an important role in determin-ing the morphologic stability of a stream channel Engineering trends in channelization are away from the uniform straight channel with uniform channel cross section and gradient and are moving toward construction of more natural appearing streams. (Stewart NC State) W77-08352

CHEMICAL AND VEGETATIVE STABILIZATION OF SOILS,
Bureau of Reclamation, Denver, Colo. Engineer-

Bureau of Reclamation, Denver, Colo. Engineering and Research Center. W. R. Morrison, and L. R. Simmons. Report No. REC-ERC-76-13, January 1977. 161 p,

Report No. REC-ERC-76-13, January 1977. 161 p 50 fig, 27 tab, 293 ref.

Descriptors: Soil erosion, Soil stability, *Soil stabilization, Soil surfaces, Soil treatment, *Chemical sealants, Vegetation establishment, *Erosion control, Asphalts, *Slope protection, Roads, Revegetation.

Roads, Revegetation.

Identifiers: Wellton-Mohawk Canal, Fort Thompson Substation, Mt. Elbert Pumped-Storage Powerplant, Mulches, Polyvinyl acetate.

A study was conducted on various chemical and vegetative methods of soil stabilization for possible use in the USBR's construction and O and M programs. Three main items of work accomplished under the study are summarized: (1) Laboratory Studies. — (a) Screening tests conducted on 30 liquid soil stabilizing materials. Based on the results, tentative performance requirements were

developed for water-based soil stabilizers. (b) Special studies conducted on materials and methods to waterproof problem soils, to arrest erosion occurring on slopes, and to bind gravel together for riprap applications. (2) Field Applications. Discussions on where various chemical and vegetative methods have been used in new construction, repositification or Quant M work. (3) struction, rehabilitation, or O and M work. (3) State-of-the-Art Survey. — A survey on chemical stabilization of soils, and revegetation methods and materials for erosion control. Results indicate that through chemical and vegetative stabilization of disturbed soils, sediment production can be reduced, fertile top soil preserved, and a more environmentally acceptable condition achieved after construction is completed. (Bur Reclam) W77-08512

8E. Rock Mechanics and Geology

AN EARTHQUAKE RISK MODEL THAT IN-CORPORATES LOCAL NEAR SURFACE SITE CONDITIONS.

California Univ., Los Angeles. School of Enineering and Applied Science.

R. T. Eguchi.

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Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 050, Price codes: A07 in paper copy, A01 in microfiche. Report UCLA-ENG-7547, June 1975. 117 p, 15 fig. 4 tab, 42 ref. (California Water Resources Center Project UCAL-WRC-W-339). OWRT B-159-CAL(2).

Descriptors: *Earthquakes, *Earthquake engineering, *Model studies, *California, *Risks, *Sites, Attenuation, Estimating, Forecasting,

Velocity, Methodology.
Identifiers: *Los Angeles(Calif), *Modified Mercalli Intensity, *Particle velocity.

An earthquake risk model that incorporates local near surface site conditions was developed and applied to the Los Angeles area. In the model, the occurrence of earthquakes in time, magnitude and space are represented by probability distributions which have been developed by others. However, the particular joint distribution of the three was developed here. The estimation of risk is ex-pressed in terms of two ground motion indices, Modified Mercalli Intensity and maximum particle velocity. Special emphasis is given to establishing the effect of local site geology on the estimation of risk. Local site factors for intensity have been adopted from the work estimation of risk. Local author to the work estimation of ISA. Local site factors for intensity have been adopted from the work of others, while site factors for maximum particle velocity were developed. The site factors for maximum particle velocity required the establishment of a near surface model, which was developed. 1971 San Fernando earthquake data are utilized to develop attenuation relationships for maximum particle velocity and Modified Mer-calli Intensity. The effects of including and excluding aftershocks on the probabilities were ob-served. Five examples are presented, three in terms of Modified Mercalli Intensity and two in terms of maximum particle velocity. Comparisons are made among the examples. A general discussion of the limitations and merits of the methods used is presented. (Snyder-California, Davis) W77-08348

POST-TENSIONED SEWER RIVER CROSSING. New Zealand Engineering, Vol. 32, No. 2, p 42, February, 1977.

Descriptors: *Sewers, *Construction, *Engineering structures, Hydraulic structures, Pipelines, Pumping plants, Equipment, Excavation, Design criteria, Flow, Monitoring. Identifiers: Hutt River(New Zealand).

A major part of the main sewer drainage of the Hutt Valley, New Zealand, was recently duplicated. This project included an on-grade sewer crossing of the Hutt River at Silverstream. Previous sewers crossing the river were true siphons or pumping mains, which entailed continu-ous operating costs and potential pollution hazards. The availability of bedrock close to the stream bed surface was confirmed. Because of a fault zone in the area, it was decided to make the 165 meters long crossing and the manholes monolithic by post tensioning. A tidy slab with a reinforced shear key was poured on the excavated rock surface. The pipe structure was post-ten-sioned with eighteen multistrand cables with five vertical anchors stressed to 70 t to anchor the crossing to the bedrock. Sewage flow is carried by two 1065 millimeters diameter pipes. Design capacity is 10,900 cubic meters/hour. Overflow pipes and service ducts were included in the construction, with a river level recording channel and a modified Parshall flume to monitor total sewage flows of the Upper Hutt basin. (Collins-FIRL) W77-08552

8F. Concrete

RESEARCH ON CEMENTS FOR GEOTHER-MAL AND DEEP OIL WELLS,

Colorado School of Mines, Golden. G. L. Kalousek, and S. Y. Chaw. Society of Petroleum Engineers Journal, Vol. 16, No. 6, p 307-309, December, 1976. 1 fig, 2 ref.

Descriptors: *Cements, *Thermal properties, *Deep wells, Laboratory tests, *Oil wells, Geothermal studies Identifiers: *Calcium silicate cements.

Strength problems frequently occur in cements used in hot wells, and appear to become worse as temperature and bottom-hole pressure increase. This study investigated the relationship between cement strength versus Ca0/Si02 ratios and the amount of A1203 in cement mixtures. The optimum composition for cement among the sub stances tested in the study was a proportion of 5 Ca0: 6 Si02 plus 7% A1203, yielding a tobermorite binder stable to 250 degrees C. A 2 Ca0: 3 Si02 composition with additions of 5% A1203 also yielded an apparently stable product when au-toclaved at 300 degrees C for 10 days. Alumina available to the binder and depending on the amount had a spectrum of effects ranging from highly beneficial to highly deleterious. Particular attention is directed to the need of differentiation between stable and meta-stable products in future research. (Eberle-NWWA)

CEMENTING OIL AND GAS WELLS, PART 2 -CASING INSPECTION AND PIPE HANDLING METHODS, INCLUDING THREAD MAKE-UP

Completion Technology Co., Houston, Tex. G. O. Suman, Jr., and R. C. Ellis. World Oil, Vol. 184, No. 5, p 69-76, April, 1977. 8

fig, 4 tab, 20 ref.

Descriptors: *Well casings, *Steel pipes, *Damages, *Inspection, Cement grouting, Non-destructive testing, Oil wells, Electronic equipment, Joints(Connections), Specifications. Identifiers: *Well casing make-up, Torque, Axial load, Power tongs, Pipe threads, Pipe thread compounds, Rig floor leak tests, Casing landing practices.

Higher equipment and service costs emphasize the need for strict attention to casing quality control and handling before cementing. Many casing probelms are directly related to conditions prior to cementing. Many casing problems are directly re-lated to conditions prior to cementing such as: metallurgical flaws, damage in transit or on location, improper make-up, or poor Sunning practices. Casing inspection can be performed by various visual and electronic means. Although fairly tight quality control is maintained at the mill, well tight quanty control is maintained at the mill, well site testing of tubular goods is suggested as a way of detecting transport and handling damage. The contractor himself can minimize handling damage by transporting casing only when thread protectors are in place, and by making sure that all equipment used in running casing is appropriate for the job and in good working order. Torque should not be the exclusive criterion for testing proper joint make-up. Make-up position should be visually inspected as a double check. (See also W77-08328) (Eberle-NWWA) W77-08327

CEMENTING OIL AND GAS WELLS, PART 3, Completion Technology Co., Houston, Tex. G. O. Suman, Jr., and R. C. Ellis. World Oil, Vol. 184, No. 6, p 48-57, May, 1977. 11 fig, 5 tab, 36 ref.

Descriptors: *Cements, *Cement grouting, *Drilling fluids, *Additives, Bentonite, Portland cements, Pozzolans, Slurries, Strength of materials, Oil wells.

Identifiers: *Cement classifications(API), Thickening time, Lost circulation, Specialty ce-

Cement slurry composition can be tailored to meet the demands of nearly every modern well comple-tion by carefully selecting the correct class of cement, the proper additives, and judging the correct volume of water to be mixed in. Important factors volume of water to be mixed in. Important ractors to be considered in well cementing are depth and downhole temperature, potential for fluid loss, time parameters, and of course, cost. Additives can be used to both increase and retard setting time, to change viscosity and permeability, vary density, reduce friction, control lost circulation, introduce gelling properties, and to ensure the cement will perform well in hostile completion environments. This article lists types and classes of cement and additives, details their chemical action, and suggests application to specific drilling situations. Properties of set cement are presented both in the text and in graphic form, and space is devoted to a brief discussion of special cements. (See also W77-08327) (Eberle-NWWA) W77-08328

CONCRETE BUCKET DISTRIBUTES
CRUSHED BEDDING EVENLY ON SEWER DISTRIBUTES

Highway and Heavy Construction, Vol. 120, No. 4, p 32-33, April, 1977.

Descriptors: *Sewers, *Concrete construction, Construction materials, Excavation, Concrete, Conveyance structures, Conduits, Piping, Clay pipes, Plastics. Identifiers: Concrete bucket.

A bottom-dump concrete bucket was used to distribute granular bedding for a sanitary sewer line. The work was done quickly and easily in otherwise inaccessible areas. Excavation of sandy, red clay soil in Dothan, Alabama, was done with an hydraulic backhoe with a 11/2 cubic yard bucket. Clay and PVC pipe were used for the project which required 23,000 linear feet of sewer line and 14,000 linear feet of water pipe. The terrain ranged rom open prairie to wooded with a creek. An eighteen-foot deep cut was planned near the creek. A right work area was created because many old trees could not be removed. A track loader with a bucket was used to carry granular material from the stockpile to the concrete bucket. The concrete bucket was attached to the backhoe bucket and lowered into a trench after backhoe excavation. The bucket dropped an even 12 inches of crushed bedding into the trench. After pipe connections were made, backfill operation was begun. A com-pactor was used to consolidate the upper 12 inches

Field 8—ENGINEERING WORKS

Group 8F-Concrete

of backfill to a 100% modified Proctor. (Collins-FIRL) W77-08556

8G. Materials

ASPHALT-RUBBER MIXTURES FOR SEEPAGE CONTROL, Arizona Univ., Tucson. Dept. of Civil Engineering

and Engineering Mechanics.
For primary bibliographic entry see Field 4A. W77-08195

KELLY CARE EXTENDS SERVICE LIFE. Drilco, Houston, Tex.
For primary bibliographic entry see Field 8C. W77-08311

BETTER PROTECTION FOR CASING AND TOOL JOINTS, Reed Tool Co., Houston, Tex.

A. E. Gooch. Drilling-DCW, Vol. 38, No. 8, p 93-96, May, 1977. 1 fig. 3 ref.

Descriptors: *Rotary drilling, *Well casings, Steel *Drilling equip Joints(Connections). equipment, pipes.

Identifiers: *Tool joint hard facings, *Casing

Casing wear, a problem that has plagued rotary drillers for decades, is caused by friction between casing and the hard-faced surfaces on the outside diameter of tool joints. Casing wear can contribute to many serious and costly well problems, however, drill string wear would pose equally costly problems if hard-facing were not used on the joints. The dilemma now seems to have been solved by a two-step surfacing process. 14-20 mesh sintered tungsten carbide pelletized surfacing is first applied to the OD of the tool joint, then a thin layer of alloy steel is applied over the tungsten carbide. The result is a bearing-type hard surface that significantly reduces abrasion and galling of casing, yet wears very little itself. In tests against various ferrous and nonferrous facing, this dual combination showed much better performance than commonly available joint wear pro-tection materials. (Eberle-NWWA) W77-08315

RESIN-COATED GRAVEL IS USED TO HELP

CONTROL SAND,
Maurer Eng. Inc., Houston, Tex.
A. R. Sinclair, and J. W. Graham.
Oil and Gas Journal, Vol. 75, No. 16, p 58-60, April 18, 1977. 5 fig, 2 ref.

Descriptors: *Gravels, *Resins, *Well filters, Oil wells. Identifiers: *Gravel packing, *Phenolic resins, Sand control.

High strength-high permeability gravel packs can now be obtained with a special resin-coated gravel. Regular sand or gravel is thinly coated with ther-mosetting phenolic resins which sets up in formations with temperature above 130 degrees F. Not only does the material remain highly porous, but the resin coating bears part of any load placed on the sand. The special gravel handles like any ordi-nary dry gravel in field use; long-term strength after setting up seems satisfactory. In several ex-perimental applications, the resin-coated material significantly improved the performance of oil wells which chronically pumped sand. Occasional failures occurred when insufficient material was placed in the well or when parts of the formation remained untreated. (Eberle-NWWA)

IT'S VOUR LOSS. R. B. McDannald. Water Well Journal, Vol. 31, No. 5, p 34-35, May, 1977. 9 tab.

Descriptors: *Pumps, *Fluid friction, Pumping, Flow characteristics, Plastic pipes, Pipes. Identifiers: *Friction loss, Submersible pumps.

Unless a well or pump contractor pays close attention to the piping in a new water system, he runs the risk that friction loss will drastically reduce the output of an otherwise adequate pump. The fol-lowing relationships should always be kept in mind when designing an individual water system: (1) the longer the pipe coming from the pump, the greater the friction loss (2) the smaller the pipe, the greater the friction loss (3) the greater the flow, the greater the friction loss (4) deposit build-up on the indside walls of the pipe can increase friction loss two or three times (5) tees, ells, and check valves con-tribute to friction loss (6) generally, plastic pipe has less friction loss than metal pipe of equivalent size, and also less chance of deposit build-up. Friction loss charts are an invaluable aid to the contractor. In addition, many pump manufacturers list friction loss for check valves in their pump specifi-cations. (Eberle-NWWA)

RESEARCH ON CEMENTS FOR GEOTHER-MAL AND DEEP OIL WELLS, Colorado School of Mines, Golden. For primary bibliographic entry see Field 8F.

AIR, MIST AND FOAM DRILLING, A LOOK AT THE LATEST TECHNIQUES, PART 2 For primary bibliographic entry see Field 8C.

CEMENTING OIL AND GAS WELLS, PART 2 -CASING INSPECTION AND PIPE HANDLING METHODS, INCLUDING THREAD MAKE-UP

Completion Technology Co., Houston, Tex. For primary bibliographic entry see Field 8F. W77-08327

CHEMICAL AND VEGETATIVE STABILIZA-TION OF SOILS,

Bureau of Reclamation, Denver, Colo. Engineering and Research Center. For primary bibliographic entry see Field 8D. W77-08512

POLYETHYLENE SEWER FORCE MAIN TAKES VARYING PRESSURES. Water and Sewage Works, Vol 124, No 4, p 108-110, April, 1977. I fig.

Descriptors: *Sewers, *Construction, *Plastics, Planning, Pipes, Physical properties, Construction materials, Pumps, Costs, Hydraulic structures.

A 16,640-foot, 14-inch polyethylene sewer force main has been constructed in Ruston, Louisiana. This is part of the first of a three stage project to rehabilitate the city's treatment system. The force renabilitate the city's treatment system. The force main is subjected to pressures of up to 100 psi. The pipe was formed by butt fusing of the joints to provide resistance to railway vibration; it is also elastic and able to withstand deflection. The Driscopipe 1000 chosen has a high molecular weight and is suited for sewer use due to its stress creek resistance stiffenses and toughters. Verice crack resistance, stiffness, and toughness. Varia-ble speed pumps will be used to minimize shock wave production when pressure is increased or dropped. A pressure profile was used and pipe thicknesses were chosen to match pressure at various points along the line. This resulted in a material and cost savings of nearly 15%. Hydraulic back-filling of the ditches eliminated the need for a man in the ditch after pipe laying. (Collins-FIRL) W77-08549

THE PROTECTION AND REPAIR OF UN-DERGROUND PIPELINES FOR WATER AND SEWAGE, M. S. Leng.

Water Services, Vol 82, No 973, p 168, 171, March, 1977.

Descriptors: *Pipelines, Metal pipes, Concrete pipes, Oxidation, Corrosion, Conveyance struc-tures, Resins, Linings, *Sewers, Chemical reactions, Corrosion control, Physical properties, Chemical properties, Hydraulic structures.

The protection and repair of underground pipelines of ferrous metals, asbestos cement, and various concretes is very important. Metal pipes are subject to various chemical reactions, such as oxidation, which causes them to revert to their original ores, and corrosion from the elements in raw sewage. Coatings of various types and cathodic protection are used to protect ferrous metal pipes. Various polymer resins are used for cement and concrete pipes. These pipes require protection primarily from sulfuric acid, acidic water and groundwater, and chemicals from industrial sources. Special equipment is available for sealing defective joints. Pipe repairs may be needed to stop excessive infiltration, protect pipes from interior chemical attack, correct damage already done, or to strengthen pipelines. Repair is expensive, but reconstruction is much more costly. (Collins-FIRL) W77-08551

PLAIN-END PIPE 'COLLARS' PROBLEM SEWER CONNECTIONS,

W S Foster The American City and County, Vol. 92, No. 4, p 76, April, 1977.

Descriptors: *Piping. *Joints(Connections), Clay pipes, Plastics, Infiltration, Costs, Physical properties, Chemical properties, Construction materials.
Identifiers: Plain-end pipes.

Plain-end pipe, which has a factory-applied polyvinyl chloride or fiber-glass-reinforced polyester plastic collar, may permit reductions of installa-tion costs in sewer collection systems. The collar is molded to provide a double bead and ensure an infiltration-tight seal; the spigot end is provided with a flexible molded band, generally of urethane rubber. The bells of flared-end pipes represented the most common site of breakage in the past. Trench excavation and pipe bedding had to be very carefully executed to provide safe and proper support for these pipes. Clay pipe has many desirable properties, but the cold mastic or cement mortar previously used to join them were not sufficiently resistant to movement or infiltration.

Jointing systems for clay pipes are now improved.

Many suppliers of bell-and-spigot type pipes expect to offer plain-end pipe in the future, and some suppliers of plain-end pipe are listed. (Collins-W77-08553

IDEAS APLENTY-BUT STILL SEWERS FACE CASH NEGLECT. Surveyor, Vol. 149, No. 4425, p 14-15, April, 1977.

Descriptors: *Sewers, *Maintenance, *Repair, *Construction, Economics, Planning, Costs, Construction materials, Tunneling, Flow, Measure-ment, Polymers, Corrosion control, Cleaning, In-

Proposals from Great Britain's Water Research Centre conference on Opportunities for Innovations in Sewerage are reported. The lack of progress towards innovation in the British sewerage industry was blamed not upon a lack of

Preparation Of Reviews—Group 10F

ideas, but on shortages in funding. British sewer systems are greatly in need of repair. A four-point plan was outlined for improvements, involving: identification of work priorities; use of existing techniques to increase sewer life; development of new technology where applicable; and increasing the efficiency and cost-effectiveness of full reconstruction techniques. The five sections of the conference fectived upon planning and design construction techniques. The five sections of the conference focused upon planning and design, construction and records, flow measurement and control, inflow and infiltration and maintenance and renovation. New synthetic materials for sewerage were suggested as replacements for traditional ones. These plastics provide high reliability and durability in drainage systems, rising mains, and gravity and trunk sewers. It was recommended that upgrading of sewerage systems be implemented, using available and new technologies, in order to counteract the effects of years of neglect on these systems. (Collins-FIRL) W77-08554

PERFORATED, VITRIFIED CLAY PIPE USED IN PEORIA FACILITIES, Water and Wastes Engineering, Vol. 14, No. 4, p

85. April, 1977.

Descriptors: *Clay pipe, *Treatment facilities, Pumping plants, Excavation, Lagoons, *Sludge treatment, Drying, Evaporation, Dewatering, Sludge disposal, Soil amendments, *Waste water treatment, *Pipes.

East Peroria, Illinois, had used 54,000 feet of 4 inch, perforated vitrified clay pipe (VCP) in constructing eight sludge lagoons and a supermatant pumping station. The lagoon acreage was decreased by two feet. Eight foot dikes were built around each lagoon. Trenches 2 feet deep and 1 around each lagoon. Trenches 2 feet deep and 1 foot wide were dug 60 feet apart. The trench base was a 6 inch bed of well-graded gravel and the pipe was covered by 6 inches of gravel and 16 inches of well-graded sand. The lagoons were convered with pea gravel. They will be charged sequentially; the maximum accumulation of sludge in each lagoon will be 2 feet. A 1 year period will elapse before the organic soil is sufficiently dry to be scraped off and stored in an adjacent area. Experimental lagoons were used to determine the spacing and depth of pipe placement. It was found that a 2 foot depth would protect pipes from damage when machinery removed the organic soil. Influent is pumped into the lagoons and the supernatant is pumped to the river upstream from the plant. The influent is treated, and the clean water is discharged into the river. The system handles nearly 30 mdg, but is expected to treat 154 mdg after completion. There is no odor problem. The 5% solids which remain after lagoon treatment is called an organic soil stabilizer. It will be produced at an annual rate of 9 to 10,000 dry tons. (Collins-FIRL) W77-08598

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8I. Fisheries Engineering

MARINE LIFE PROTECTOR. U.S. Patent No. 3,996,138, 10 p, 6 fig, 18 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 284, December 7, 1976.

Descriptors: *Patents, *Intakes, Structures, Orifices, Engineering structures, Protection, Aquatic

A device for protecting marine life from water in-take ducts is presented. The intake duct enters the marine life protector which is characterized as an inner body of water separated from the main outer body of water by means of barrier walls. Through one or more of these barrier walls, input ducts are arranged which pass through the barrier walls hav-ing their longitudinal axes other than parallel to the free surface of the water bodies so that the input

and exit orifices of the ducts are at different water levels. At least one of these orifices may be covered with a grating or screening or other additional protective means. (Sinha-OEIS) W77-08262

27TH NORTHWEST FISH CULTURE CON-For primary bibliographic entry see Field 2I. W77-08309 FERENCE.

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

INVENTORY OF WATER RESOURCES RESEARCH AT THE UNIVERSITY OF WYOM-ING, FISCAL YEAR 1975, Wyoming Univ., Laramie. Water Resources

Research Inst. L. K. Perry.

L. N. Perry.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-268 560, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Series No. 54, January 1975. 62 p. OWRT A-999-Wyo(22).

Descriptors: *Water resources, *Research and development, *Water Resources Institute, Colleges, *Universities, Training, Personnel, Research facilities, *Wyoming, Projects.

A summary is presented of water resources research in progress at the University of Wyoming, a brief description of outstanding research facilities, and a list of researchers and faculty currently engaged in water resources research. W77-08506

9D. Grants, Contracts, and Research Act Allotments

INVENTORY OF WATER RESOURCES RESEARCH AT THE UNIVERSITY OF WYOM-ING, FISCAL YEAR 1975, Wyoming Univ., Laramie. Water Resources Research Inst.

For primary bibliographic entry see Field 9A.

W77-08506

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition **And Processing**

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10B. Reference and Retrieval

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10C. Secondary Publication And Distribution

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10F. Preparation Of Reviews

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